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A review of the genus *Rheocricotopus* Thienemann & Harnisch, 1932, with the description of three new species

(Diptera, Chironomidae)

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Generic diagnoses are given to all stages of *Rheocricotopus* Thienemann & Harnisch. Keys to all stages of species from the Holarctic region are given. The genus is divisible into two clearly monophyletic groups, subgen. *Rheocricotopus* s. str. and subgen. *Psilocricotopus* subgen. nov. *Psilocricotopus* is characterized by normally undivided female tergite IX; sharply pointed crista dorsalis; pupa with frontal setae on prepons, without abdominal spine patches, and caudal spines on segments VII and VIII, and larvae with long body setae. *Rheocricotopus* s. str. has divided female tergite IX; rounded or vestigial crista dorsalis; pupae with frontal setae on frontal apotome, spine patches and lacking caudal spines on segments VII and VIII; and larvae with shorter body setae. Within *Psilocricotopus* there apparently are three monophyletic groups, the *atripes* group with large rectangular humeral pits, the *chalybeatus* group with relatively large usually ovoid pits, and the *godavarius* group with small pits. Within the nominal subgenus *R. effusus* (Walk.) and related species form a monophyletic group based on the shape of the superior volsella. *R. (R.) tuberculatus* Cald. forms a group by itself, while the species grouped around *R. fuscipes* (Kieff.) may not be monophyletic. Three new species are described: *Rheocricotopus (Psilocricotopus) conflusivus*, *R. (R.) amplicristatus*, and *R. (R.) effusoides*. The two firstmentioned species are described as male imagines only while both sexes and all stages are described of *R. effusoides*. The male of *R. (P.) chapmani* is described for the first time, the male of *R. (P.) glabricollis* (Meig.) and the females of *R. (P.) chapmani* (Edw.), *R. (P.) robacki* (Beck & Beck), *R. (P.) chalybeatus* (Edw.), *R. (P.) glabricollis* and *R. (R.) effusus* are redescribed while additional notes on some of the remaining species are given. The pupa and larva of *R. (P.) robacki* (Beck & Beck), *R. (P.) chalybeatus*, *R. (P.) glabricollis* and the pupa of *R. (R.) effusus* and *R. (P.) tirolus* Lehm. are redescribed. Three new synonyms are given: *R. (P.) glabricollis* Meig. (syn. *R. extatus* [Rob.]), *R. (P.) robacki* (Beck & Beck) (syn. *R. kenorensis* Saeth.), and *R. (R.) effusus* (Walk.) (syn. *R. striatus* [Mall.]). The synonymy of *R. (P.) glabricollis* with *R. gouini* (Goethgebuer) is confirmed.

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Introduction

The larvae of the genus *Rheocricotopus* Thienemann & HARNISCH (1932) are rheophilic in streams and rivers with a few species also found in springs and littoral in lakes (CRANSTON 1982: 132; CRANSTON, OLIVER & SAETHER 1983: 195). Although the genus belongs to one of the better known orthoclad genera much confusion remains because of erroneous descriptions and nomenclature. THIENEMANN & HARNISCH (1932: 138) give a key to larvae. Here, however, *R. fuscipes* (Kieffer) is keyed out three times under different synonyms. ZAVŘEL (1938: 4) also gives a key to larvae including three species which all, however, are synonyms of *R. effusus* (Walk.). The description by GOUIN (1936: 168) of the larva of *R. gouini* (Goetghebuer), a junior synonym of *R. glabricollis* (Meigen), is erroneous in showing the median teeth of mentum as much paler than the remaining teeth. The median teeth may be slightly paler in some specimens. LEHMANN (1969) suggested a number of synonyms, but retained the junior names. SAETHER (1969: 85) gave a description of three new species, with additional characters given in SAETHER (1971). *R. kenorensis* Saether was thought to differ from *R. robacki* described by BECK & BECK (1964: 204) since the latter erroneously was said to have only 1 spur on the hind tibia. Reexaminations however, show that *R. robacki* (Beck & Beck) is a senior synonym of *R. kenorensis*. Of the other Nearctic species previously assigned to the genus two, *R. chapmani* (Edw.) and *R. lacteipennis* (Joh.), were described on the base of females (EDWARDS 1935: 471, JOHANNSEN 1908: 282). A reexamination and new material show that *R. chapmani* is closely related to *R. chalybeatus* (Edw.), *R. robacki* and *R. tirolus* Lehm., but differ from them all; while *lacteipennis* belong in a new genus and will be redescribed separately. ROBACK (1957: 84) described *Trichocladus extatus* which he regarded as belonging in the *Rheocricotopus* group. SAETHER (1970: 99) on the base of the "palmate" S I placed the species in *Psectrocladius*. Also the male antennal ratio appeared to be much too high for a *Rheocricotopus*. It was therefore desirable to reexamine the types. The S I really does have several apical teeth, but is not "palmate", and the antennal ratio given by Roback was erroneous. The species is a synonym of *R. glabricollis*. *R. striatus* (Mall.) appeared close to *R. effusus*. A reexamination of the type of *R. striatus* and a comparison with *R. effusus* showed that the two species were conspecific. In order to place and compare three new Nearctic species described below it was also necessary to reexamine other previously described species and give some additional measurements.

Methods and morphology

Morphological nomenclature follows Saether (1980a). The measurements are given as ranges followed by a mean when four or more measurements are made, followed by the number measured in parentheses (n). In the figures of the male hypopygia the dorsal aspect is shown to the left, the ventral aspect and the apodemes to the right.

Collections where material is kept are as follows:

- ANSP: Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania, U.S.A.
- BAC: Collection of B. A. Caldwell, Department of Natural Resources, Atlanta, Georgia.
- BMNH: British Museum (Nat. Hist.), London, England.
- CNC: Canadian National Collection, Ottawa, Ont., Canada.
- CUC: Cornell University Collection, Ithaca, New York, U.S.A.
- FSCA: Florida State Collection of Arthropods, Florida A & M University, Tallahassee, Florida, U.S.A.
- INHSC: Illinois Natural History Survey Collection, Champaign, Illinois, U.S.A.
- MNHN: Museum National d'Histoire Naturelle, Paris, France.
- PHL: Collection of P. H. Langton, March, Cambridgeshire, England.
- RNSSL: Royal Norwegian Society of Science and Letters, the Museum, Trondheim, Norway.
- RSW: Collection of R. S. Wilson, University of Bristol, Bristol, England.
- USNM: U.S. National Museum, Washington, D.C., U.S.A.
- ZMBN: Museum of Zoology, University of Bergen, Bergen, Norway.
- ZSM: Zoologische Staatssammlung, Munich, West Germany.

Extensive and complete lists of synonyms are not included since these can be found in HIRVENOJA (1973: 340) and SUBLETTE (1967: 532, 1970: 64). The more important synonyms, however, are necessary to include since the list of synonyms given by Hirvenoja often has been overlooked.

Rheocricotopus Thienemann & Harnisch, 1932

Type species: *Rheocricotopus effusus* (Walker). (See, however, ASHE [1983: 47] who states that BRUNDIN [1956: 118] misidentified *R. fuscipes*. Brundin, however, merely synonymized the two species and there is no evidence for *R. effusus* being misidentified. The comments by Ashe thus seem invalid.)

Diagnostic characters: The combination of hairy eyes, well developed pulvilli, acrostichals starting in front, platelike superior volsella, and pointed anal point with caudolaterally directed setae will separate the genus from other orthocladids except *Paracricotopus* Thienemann et Harnisch which, however, has setae of tergites placed in two regular, transverse rows.

The combination in the pupa of short frontal setae, well developed thoracic horn, low or absent pedes spurii B, tergites with or without rounded patch of spinules and with caudal spines, no filamentous setae on segment VI, long and strong anal macrosetae, and a complete fringe on the anal lobe will separate most species of the genus from other orthocladids. (*R. [R.] tuberculatus* Caldwell with strong spines in spine patches may be separable from the *Psectrocladius sordidellus* group merely by the absence of lamelliform L-setae on segment VI and the shorter frontal setae. *R. tirolus* Lehmann without fringe on anal lobe lacks spinule patches. The absence of frontal setae together with the general characters mentioned above will separate this species from other orthocladids.)

The distinct ventromental plates with well developed cardinal beard beneath together with the bifid (or occasionally apically toothed, but not palmate) S 1 and the relatively short apical mandibular tooth will separate the larva of the genus from that of other genera.

Imago

Small to medium sized species, wing length 1.1–3.3 mm. Coloration yellow to brownish black, when not completely dark with brown to brownish black vittae and markings, often brown with only scutellum pale. Eyes hairy, not extended dorsomedially. Male antenna with 13 flagellomeres, groove beginning on flagellomere 3, sensilla chaetica present on flagellomeres 2 and 3 or 2–4 and ultimate; antennal ratio 0.3–1.9. Female antenna with 5 flagellomeres. Temporals few; inner verticals separate, minute or absent; outer verticals conspicuous, often on tubercles, few; postorbitals usually absent. Tentorium often with distinctive, small wart-like or spine-like tubercles at sieve pore. Coronal suture of female reduced or absent, occasionally complete. Palp 5-segmented, segments progressively longer or occasionally third and fourth segment subequal, third segment with 1–7 lanceolate sensilla clavata at apex. Anteprepronotum well developed; median lobes scarcely to moderately narrowed, gaping, meeting at point anterior to scutal projection, with several to numerous lateral setae. Humeral pit often large, pale, weakly sclerotized and conspicuous; sometimes small and normal. Acrostichals very small and indistinct to moderately large, starting in front at scutal projection or occasionally in centre of scutum, dorsocentrals few to relatively numerous, uniserial but occasionally partly biserial in front. Scutellars uniserial, few to numerous. Wing membrane without setae, punctation of microtrichia visible at 100–300 \times . Anal lobe well developed to absent. Costa not to moderately extended; R_{2+3} running close to R_{4+5} , ending midway between ends of R_1 and R_{4+5} or closer to end of R_{4+5} , usually distinct, occasionally vestigial; R_{4+5} ends clearly distally of end of M_{3+4} ; FCu lies distally of RM; Cu_1 straight to slightly curved; vannal fold ends distally of FCu; An ends proximally or below FCu. Sensilla campaniformia about 9–12 at base of brachiolum, 3 below seta, and about 9–12 at apex of brachiolum; 2–3 on subcosta; 1 on FR; and 1 at base of R_1 . Brachiolum and R with setae in male, also R_1 and R_{4+5} with setae in female. Squama with none to several (0–25) setae. Pulvilli well developed (except in *R. capensis*

Freeman). Comb and hind tibial spurs normal. Pseudospurs absent. Sensilla chaetica usually present in low numbers in basal third of tarsomere of middle leg in male, nearly always present in moderate to high numbers on middle leg of female; occasionally present also on tarsomere 1 of hind leg of male and nearly always present on hind leg of female. Setae of tergites with lateral and median groups of setae and occasionally additional anterior and posterior transverse rows. Male with well developed anal point tapering to sharp point, with lateral setae directed obliquely posteriolaterally, without microtrichia at least in apical half of anal point proper, with or without setae at base on tergite IX. Transverse sternapodeme usually strongly curved, oral projections small to large. Virga absent. Gonocoxite with a broad, completely bare, plate-like and sclerotized, rounded or with triangular to tooth-like projection, superior volsella at anterior inner margin; and well developed inferior volsella often divided into 2 small lobes, with the dorsal lobe nearly free of microtrichia. Gonostylus sometimes with outer corner, usually with well developed preapical or occasionally apical, triangularly pointed or low and rounded crista dorsalis, occasionally crista dorsalis reduced. Tergite IX of female divided into two setigerous protrusions, with a median fissure, or completely undivided; with relatively few to numerous setae. Gonocoxite IX well developed, with several strong and fewer weak setae. Gonapophysis VIII divided; with ventrolateral lobe rounded, large or low; apodeme lobe distinct, visible between principal lobes or partly or fully covered by ventrolateral lobe; dorsomesal lobe narrow but distinct, with long microtrichia. Labia relatively large, apically rounded, occasionally with apical microtrichia. Coxosternapodeme evenly rounded, with more or less pronounced angle at median apex. Seminal capsules large, ovoid, with or without triangular neck, usually not strongly sclerotized, void of microtrichia. Spermathecal ducts with bend, but seldom with complete loop, openings separate. Postgenital plate large, bluntly triangular. Cercus moderately sized.

Pupa

Small to medium sized pupae, 2.5–5 mm long. Frontal seta short or absent, on frontal apotome (*Rheocricotopus s. str.*) or on prefrons (*Psilocricotopus*). Frontal apotome without warts, smooth or wrinkled. Antennal sheath without pearl row above pedicel. Ocular field at least sometimes with 2 postorbitals and 1 vertical, apparently usually with 1 postorbital only. Antepnotum with 2 median and 2 lateral setae of which one is reduced or marked by a small peg only. Thoracic horn digitiform to more club-shaped and covered with spinules except at extreme base and apex or occasionally nearly bare. Precorneal setae equal or unequal in size, not located on common or separate tubercles. Four dorsocentrals present, the 3 last ones or the 2 middle ones grouped together or the 2 first and the 2 last ones grouped together; prealar absent or vestigial. Thorax nearly smooth or slightly reticulate. Wing sheath smooth. Tergite I without shagreen; II–VI essentially without shagreen or II with anteriolateral and often median faint shagreen, III with extensive shagreen and IV–VI with extensive shagreen except laterally; VII–VIII with median and/or posterior patches of shagreen; IX with shagreen in anterior 1/2. Sternites I and IX without shagreen, II with or without median shagreen, III–VI with more or less extensive shagreen, VII–VIII with anterior shagreen. Tergite II with rows of weak caudal hooklets on protuberance. Tergites III (IV) or V (VI) with (*Rheocricotopus s. str.*) or without (*Psilocricotopus*) round median patches of strong spinules to spines. Caudal margin of tergites II–VI or III–VI (*Rheocricotopus s. str.*) or II–VIII or III–VIII (*Psilocricotopus*) with spines: (Occasionally very weak caudal spines present on tergite VII or VII–VIII also in *Rheocricotopus s. str.*) Mostly orally directed spinules present caudally of spines on tergites III–IV or III–V or on conjunctives III/IV–IV/V or III/IV–V/VI. Sternites IV–VI with or without posteriolateral row of fine spines in front of pedes spurii A. Pedes spurii A present on sternites IV–VI/VII. Pedes spurii B absent or weak to relatively well developed and present on segment II, sometimes also on III. Segment I with 5 D setae, 2–3 L setae and 2–3 V setae. Segments II–IV with 3 hair- or bristle-like L setae; V–VI with 3–4 hair- or bristle-like L setae; VII with 3–4 lamelliform L setae, or occasionally all setae bristle-like; VIII with 4–5 lamelliform L setae, or occasionally only 1 L seta lamelliform. Segments II–VIII with 2 dorsal and 1 ventral o setae. Apophyses

well delineated. Anal lobe with sparse to relatively dense (8–37) fringe of lamelliform setae or fringe occasionally absent (*R. [P.] tirolus* Lehmann) and 3 subequal, long (about 1.5 times as long as lobe) anal macrosetae. Male genital sac overreaching anal lobe, with apicolateral digitiform elongation.

Larva

Small to medium large larvae, up to 9.5 mm long. Frequently with brown thoracic striations. Head capsule mostly yellowish with dark postoccipital margin, occasionally (*R. [R.] tuberculatus* Caldwell) with posteroventral, conical tubercles. Antenna with 5 segments, segments consecutively smaller until fifth, which is subequal to or slightly longer than fourth. Ring organ low on basal segment; blade shorter than flagellum; Lauterborn organs distinct, shorter than, subequal to or slightly longer than segment 3. S I bifid or occasionally with 6–7 apical teeth. Pecten epipharyngis consisting of 3 smooth, usually subequal scales, occasionally outer scales broader. Chaetulae laterales 3–6, simple; chaetulae basales single or with an apical thin spine. Premandible with 1 apical tooth, brush absent. Mandible with apical tooth shorter than width of 3 inner teeth; seta subdentalis with apical hook; seta interna with 5–6 branches, simple or with bluntly plumose apices. Mentum with 2 median teeth or occasionally single median tooth (*R. [R.] tuberculatus*), with or without accessory teeth; 5 pairs of lateral teeth; ventromental plates broad, extending beyond margin of outer mental tooth, with numerous (12–33) setae in cardinal beard. Maxilla with well developed pecten galearis, anterior lacinial chaeta sometimes triangular. Parapods well developed, claws of anterior parapods with some inner teeth. Procercus higher than wide, usually with distinct medioposterior spur, with 3–5 anal setae. Anal tubules relatively short. Body setae relatively short (up to 85 μm long, *Rheocricotopus* s. str.), to relatively long and strong (the longest more than 100 μm long, *Psilocricotopus*).

Systematics

The genus *Rheocricotopus* has been placed in a group including *Psectrocladius* Kieffer, *Paracricotopus* Thienemann & Harnisch, *Mesocricotopus* Brundin, and *Nanocladius* Kieffer both by BRUNDIN (1956: 118) and by SAETHER (1977 fig. 36, 1980: 131, 1981: 224, 1983 fig. 5). SAETHER (1981, 1983) shows that *Paracricotopus* forms the sister group of *Rheocricotopus*. The present investigation shows that the similarities particularly between *Psilocricotopus* subgen. n. and *Paracricotopus* are even larger than previously assumed both between the females and the pupae. *Rheocricotopus* s. str. on the other hand, particularly with the description of the pupa of *R. (R.) tuberculatus*, has become even more similar to *Psectrocladius*. Except for the larva the subgen. *Psilocricotopus* could easily be incorporated in *Paracricotopus*, and *Rheocricotopus* s. str. with some more difficulty into *Psectrocladius*. However, the larvae of all three genera seem to preclude this and even if there is no unambiguous synapomorphy showing the genus to be monophyletic, underlying synapomorphies such as a similar development of the humeral pit in both subgenera apparently support the homogeneity of the genus. The plate-like superior volsella appears to be better developed in *Rheocricotopus* than in *Paracricotopus* which could be an autapomorphy for the genus. However, the examined males of *Paracricotopus* in SAETHER (1980) were not mounted from fresh material and could be somewhat bleached. (The superior volsella was not included in the diagnosis of *Paracricotopus* but is shown in the figure of *P. niger* [Kieff.] [SAETHER 1981 fig. 1E].) Since several females and immatures still are unknown, material from other regions deserve re-examination, and the larvae indicate that the genus is monophyletic, the genus should at least for the present be kept together.

The two previous species groups clearly each deserve subgeneric rank. However, in view of the lack of unambiguous synapomorphies for the genus as a whole and the presence of several close parallelisms or underlying synapomorphies between the subgenera, it is quite possible that further species or undescribed stages may show more intermediates and obscure the division.

Although, as mentioned, much potential information remains it is now possible and desirable to attempt to delineate the cladogenesis of the sufficiently known species. A scheme of argumentation is presented in Fig. 1. Trends showing the same directions are grouped. The following trends are used (a = apomorphic, p = plesiomorphic):

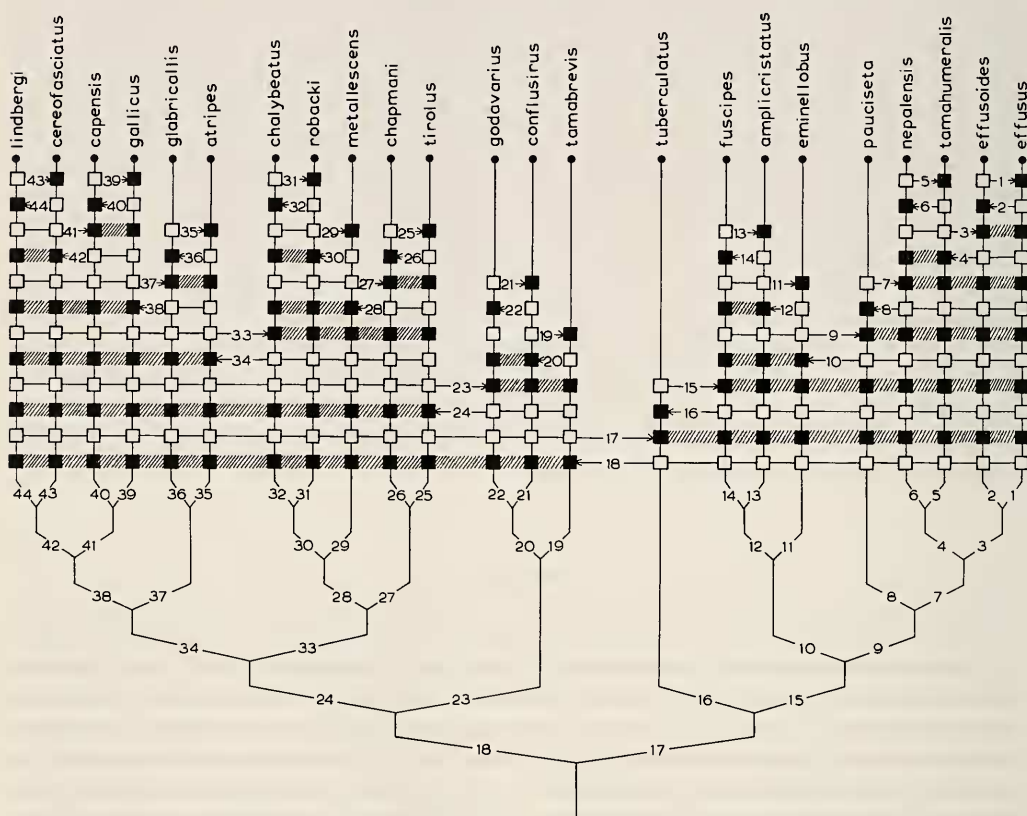


Fig. 1. Scheme of argumentation delineating the cladogenesis of the species of *Rheocricotopus* by means of trends 1-44 (p. 64-68).

Trends 1

Male AR 0.9-1.3 (a); AR 1.5-1.6 (p). - Sensilla chaetica of tarsomere 1 of mid leg absent in both sexes or present in low numbers in female (a); present in both sexes and in relatively high numbers in female (p). - Frontal setae of pupa short (a); long (p).

Trends 2

Spine patch of pupal tergite IV slightly reduced (a); equally strong on IV, V and VI (p). - Anal point with 15-19 setae (a); with 5-13 setae (p). - Conjunctive V/VI without spinules (a); with some (p).

Trends 3

Humeral pit divided into very large characteristically shaped ellipsoid upper part and a smaller parallel ellipsoid lower pit (a); undivided and of different shape (p). - Pedes spurii B on segments II and III (a); on II (p).

The pupa of *R. (R.) nepalensis* Lehm. is unknown and pedes spurii B not shown in *R. (R.) tamahumeralis* Sasa and the last trend may conceivably be incorrect.

Another possible trend belonging here is:

Larval mentum without distinct accessory teeth (a); with (p).

The larvae are known from only 5 species of the nominal subgenus. However, the presence of an accessory tooth appears to be the plesiomorphous character alternative since a similar configuration is present in *Psilocricotopus* and in related genera. The absence of the accessory tooth must be regarded as a reduction. Trends regarding higher chaetotaxy can be erected for several characters both for these species and for some of the other larger species, particularly *R. (R.) fuscipes* and *R. (P.) glabricollis*, but probably are size related and consequently of low phylogenetic value.

Trends 4

Humeral pit large and ovoid with a characteristic lower notch (a); different (p). – Anal lobe reduced (a); well developed (p). – Squama with 2–5 setae (a); with 4–22 setae, more than 6 in normal specimens (p).

Trends 5

Inferior volsella with tooth-like process (a); without (p). – Squama with 2–4 setae (a); with about 5 (p).

Trend 6

Anal lobe of wing strongly reduced (a); less strongly reduced (p).

R. (R.) tamahumeralis and *R. (R.) nepalensis* are very close and may well show up to be conspecific.

Trends 7

Superior volsella with tooth-shaped caudomedian projection (a); rounded or with broad triangular projection incorporating nearly all of volsella (p). – Humeral pit large, ovoid to ellipsoid (a); small, appearing to consist of partly fused small marks (p).

Both these trends appear quite secure. Large humeral pits do occur parallely also in *Psilocricotopus*, but the shapes are quite different.

Trends 8

Gonostylus shortened and widened with reduced crista dorsalis (a); normal (p). – Male AR 0.6–0.8 (a); AR 0.9–1.6 (p).

Trend 9

Superior volsella with tooth-shaped or broadly triangular caudomedian projection (a); bluntly rounded, right-angled (p).

Trend 10

There is no unambiguous trend here. A reduction in the extensiveness of the pupal shagreen and a tendency to reduction in number of filamentous setae on segment VIII (from 5 to 4–5) may be synapomorphies for the group to the left. Similarly the group delimited by trend 10 may have smaller setigerous protrusions of female tergite IX, smaller female gonocoxites and lower chaetotaxy of the female genitalia. However, not all immatures and females of the species are known.

Trends 11

Fringe of pupal anal lobe reduced (8–10 filaments) (a); not reduced (more than 12 filaments) (p). – Inferior volsella strongly projecting (a); not strongly projecting (p). – Crista dorsalis reduced (a); present (p). – Male AR reduced (0.7–0.9) (a); AR higher than 1.0 (p).

Parallel reductions of both crista dorsalis and AR take place in *R. (R.) pauciseta* Saeth.

Trend 12

Crista dorsalis long, prominent but low (a); crista dorsalis short or absent (p).

Trends 13

Costa not extended (a); costa extended (p). – Gonostylus excluding crista dorsalis tapering (a); wider near apex (p). – Crista dorsalis large and elongate, but rounded (a); somewhat smaller (p).

R. (R.) amplicristatus spec. nov. is the only member of *Rheocricotopus* s. str. without costal extension. However, parallel reduction takes place in *R. (P.) chalybeatus* plus *R. (P.) robacki* and the costal

extension is very short in *R. (R.) tuberculatus* and *R. (R.) eminellobus* Saeth. The gonostylus most similar to *R. (R.) amplicristatus* belongs to *R. (R.) nepalensis*.

Trend 14

R. (R.) fuscipes apparently only has autplesiomorphies as compared to *R. amplicristatus*. The sometimes indicated outer corner or even spine on the gonostylus, however, could perhaps be regarded as an autapomorphy.

Trend 15

Tergite IX of female completely divided into two distinct setigerous protrusions (a); division incomplete and less distinct (p).

Trends 16

Abdominal shagreen of pupa strongly reduced with spurs of patches exceptionally strong (a); shagreen more or less extensive with spinules of spine patches grading over in shagreen (p). – L setae of segments V–VII as 3:3:3:4–5 (a); as 4:4:4:4–5 (p). – Pedes spurii B absent (a); present (p). – Anal macrosetae of pupa not apically hooked (a); hooked (p). – Mentum with single median tooth (a); with double (p). – Head capsule with posteroventral tubercles (a); without (p).

Trends 17

Tergite IX of female divided into two setigerous protrusions (a); not divided, or secondarily weakly divided by a median fissure (p). – Gonostylus with low and rounded or absent crista dorsalis (a); crista dorsalis pronounced, triangular (p). – Superior volsella relatively large, rounded or with pronounced projection (a); smaller, rounded (p). – Tergites with patches of spines or spinules (a); without (p). – Tergites VII and VIII at most with weak indication of caudal spinules (a); with caudal spines (p).

The two subgenera are easily separable in all stages. However, the directions of the above trends as well as of trends 18 are somewhat ambiguous. Spine patches, for instance, occur scattered throughout all the closely related genera.

Trends 18

Frontal seta of pupa on prefrons or absent (a); on frontal apotome (p). – Body setae of larva long, more than 100 µm long (a); shorter, less than 85 µm long (p).

The displacement of the frontal setae to the prefrons is a common occurrence in several orthocladus including *Paracricotopus*. The placement of these setae on the frontal apotome, however, clearly is the apomorphic position anagenetically, and the similarity between *Paracricotopus* and *Psilocricotopus* based on underlying synapomorphy. See, however, the introduction to the systematics part.

Trends 19

There apparently is no clear autapomorphy for *R. (P.) tamabrevis* Sasa as compared to *R. (P.) conflusirus* spec. nov. and *R. godavariensis* Lehm.

Trends 20

Anal lobe of wing reduced or absent (a); moderately developed (p). – Anal point with 5–6 setae (a); with 10–11 (p).

Trend 21

Leg ratio of front leg about 0.6 (a); about 0.7 (p). (Although the LR is not given by LEHMANN, the leg ratios of mid and hind legs indicate that the front leg ratio in *R. (P.) godavariensis* is about as in *R. (P.) tamabrevis*.)

Trends 22

Anal lobe of imago absent (a); well developed to reduced (p). – Male AR 0.3 (a); 0.4 or higher (p). – Squama of male bare (a); with 4 or more setae (p).

Trends 23

Anal lobe of imago reduced (a); moderately to strongly developed (p). – Male AR 0.6 or lower (a); 1.0 or higher (p). – Squama of male with 0–5 setae (a); with 4–22 (p).

Trend 24

Humeral pit moderately large to very large (a); small, appear to consist of partly fused small pits (p).

Trends 25

Pupal anal lobe without fringe (a); with (p). – Only L₁ seta of segment VIII filamentous, the other bristle-like (a); all L setae of VII and VIII filamentous (p).

Trend 26

R. (P.) chapmani apparently only have symplesiomorphies as compared to *R. tirolus*.

Trend 27

Humeral pit narrowly ovoid, distinctly egg-shaped (a); humeral pit differently shaped (p).

The characteristic egg-shape is unique to *R. (P.) tirolus* and *R. (P.) chapmani*. However, the shape of the humeral pit in the other species of the group is not necessarily more plesiomorphous.

Trend 28

Leg ratios of male reduced (LR₁ lower than 0.7) (a); not reduced (LR₁ 0.7 or higher) (p).

Trend 29

Scutum with strong bluish metallic sheen (a); metallic sheen absent or slight (p).

Trends 30

Costa not extended (a); extended (p). – Caudal margin of pupal tergite VIII with weak and short spines (a); with relatively long, strong spines (p).

The last of these two trends may belong here or may be shown to belong to trend 28 when the pupa of *R. (P.) metallescens* is known.

Trend 31

There are no non-ambiguous autapomorphies for *R. (P.) robacki* as compared to *R. (P.) chalybeatus*. The slightly lower chaetotaxy is correlated with a slightly smaller size and could be regarded as an autapomorphy.

Trend 32

Gonostylus with a characteristic sharply upwards distal bend apparently fused with an apical crista dorsalis (a); of different shape (p).

Trends 33

Humeral pit ovoid, moderately large (a); of different shape (p). – L setae of segments V–VIII as 3:3:3–4:4–5 or occasionally with fourth vestigial seta also on IV and V (a); L setae all well developed, as 4:4:4:4–5 (p). – Pedes spurii B absent (a); present (p). – Outer scales of pecten epipharyngis broader than median scale (a); scales subequal (p).

The last trend may belong here or under trends 28 or 30. An underlying synapomorphy for the *chalybeatus* group is the capacity in females of some specimens of some species for division of tergite IX.

Trends 34

Humeral pit very large, rectangular, characteristic (a); pit smaller and shaped differently (p). – Median teeth of larval mentum without accessory tooth (a); with (p). (See trends 3.)

Trends 35

Squama with about 6 setae (a); with 12–25 setae (p). – First tarsomere of male middle leg with 2 sensilla chaetica (a); with 4–12 (p).

These and a number of other trends based on chaetotaxy and measurements primarily are related to the smaller size of *R. (P.) atripes*.

Trend 36

S I of larva with 6–7 apical teeth (a); bifid (p).

Although apical teeth or plumosity is the general plesiomorphous character alternative within orthoclasts, the division in *R. (P.) glabricollis* appear to be a secondary division as some specimens have two branches each split into 3–4 teeth.

Trend 37

There is no non-ambiguous trend here based on present knowledge. The second trend under 34, however, may belong here.

Trend 38

Costa extension short to moderately long (a); long (p).

Trend 39

Based on available descriptions there is no non-ambiguous autapomorphy for *R. (P.) gallicus* Lehm. as compared to *R. (P.) capensis*.

Trends 40

Number of setae on scutellum very low (4) (a); more numerous (p). – Male AR 0.9–1.0 (a); AR about 1.4 (p).

Two other trends probably belonging here are:

Sensilla chaetica absent (a); present at least in female (p). – Pulvilli reduced (a); well developed (p).

LEHMANN (1979: 35) stated that the pulvilli in *R. (P.) capensis* at most are indicated and that there are no sensilla chaetica. However, according to FREEMAN (1956: 317) the pulvilli are well developed. The sensilla chaetica also easily are overlooked.

Trend 41

Costa barely extended (a); clearly extended (p).

Trends 42

Anal lobe of male not projecting (a); very slightly to strongly projecting (p). – Ground colour of thorax and abdomen yellowish to yellowish brown (a); brown to black (p).

Trend 43

Abdomen two-coloured with yellow segments 1 and 8 or 1 and 6–8 (a); uniformly yellow with brownish tinge (p).

Trend 44

Scutellum whitish yellow (a); darker (p).

The last few trends are rather ambiguous. In some other orthoclad groups there is polymorphism in the shape of the anal lobe, the costal extension and the coloration, and it is not inconceivable that some species of the *atripes* group are synonyms of others.

The above synapomorphic diagram shows the subgenera very clearly and makes it reasonable also to erect six species groups, three in each subgenus. The three groups of *Psilocricotopus*; the *godavarius* group, the *chalybeatus* group, and the *atripes* group; clearly all are monophyletic; while of the three groups in *Rheocricotopus* s. str.; the *turberculatus* group contains only one species, the *effusus* group very clearly is monophyletic, while the *fuscipes* group may not be monophyletic.

It is interesting to note that while the nominal subgenus has representatives only from the Holarctic region with only *R. (R.) nepalensis* from Nepal on the margin of the region, *Psilocricotopus* also is present in the Afrotropical region including the Azores, and the distribution in or near the Holarctic region ranges from Japan, Nepal and Afghanistan to Greenland. Most likely the species described by JOHANNSEN (1932: 726–728) from Indonesia also belong to *Psilocricotopus*, *R. (P.) lobalis* (Johannsen) probably to the *atripes* group, *R. (P.) rigida* (Johannsen) and *R. (P.) mediocris* (Johannsen) probably to the *godavarius* group. The distributions appear to confirm *Psilocricotopus* as the more plesiomorphic subgenus.

Keys to Rheocricotopus

(*R. lobalis*, *R. rigida* and *R. mediocris* from Indonesia, see above, are not included in the keys.)

Key to male imagines

1. Gonostylus either with pronounced, preapical, triangular crista dorsalis or with apically sharp upward bend fused with apparent crista dorsalis; humeral pits either very large and rectangular, moderately large and circular to ovoid, or small and indistinct; superior volsella rounded, relatively small, never with projection *Psilocricotopus* subgen. nov. 2
 - Gonostylus without crista dorsalis or crista dorsalis long, low, rounded and preapical; humeral pits either large and ellipsoid or small and indistinct; superior volsella large, nearly rounded, nearly right-angled or with pronounced projection *Rheocricotopus* s. str. 15
2. Humeral pits small and indistinct, appear to consist of several small, partly fused circular pits; AR 0.6 or lower *godavarius* group 3
 - Humeral pit very large to moderately large, rectangular to ovoid, AR 0.8 or higher 5
3. Squama bare, AR about 0.3 (LEHMANN 1969 figs. 9, 14 b, 19 c) *R. (P.) godavarius* Lehmann (Nepal)
 - Squama with 4–5 setae, AR about 0.4–0.6 4
4. LR₁ about 0.70, anal point with about 10 setae, AR about 0.4 (SASA 1983 fig. 24)
 - *R. (P.) tamabrevis* Sasa (Japan)
 - LR₁ about 0.60, anal point with about 5 setae, AR about 0.6 (Fig. 2)
 - *R. (P.) conflusivus* spec. nov. (Nearctic)
5. Humeral pit moderately large; ovoid or circular, if large and somewhat rectangular gonostylus bent sharply upwards distally *chalybeatus* group 6
 - Humeral pit very large, rectangular *atripes* group 10
6. Gonostylus bent sharply upwards distally and fused with an apical crista dorsalis (LEHMANN 1969 figs. 1, 12 b) *R. (P.) chalybeatus* (Edwards) (Palearctic)
 - Gonostylus not bent sharply upwards, crista dorsalis tooth-like or triangular and preapical 7
7. Costa distinctly produced; AR about 0.8; wing length about 1.0 mm; thorax with strong bluish metallic sheen (FREEMAN 1956 fig. 5 d) *R. (P.) metallescens* (Goetghebuer) (Afrotropical)
 - Costa not to moderately produced; AR 1.0–1.3; wing length 1.2–1.7 mm; thorax without metallic sheen 8
8. Costa not produced; humeral pit broadly ovoid, nearly circular (SAETHER 1969 fig. 44, 1971 fig. 6 B)
 - *R. (P.) robacki* (Beck & Beck) (Nearctic)
 - Costa moderately produced; humeral pit narrowly ovoid 9
9. Squama with 9–22 setae, AR 1.2–1.3 (Fig. 4) *R. (P.) chapmani* (Edwards) (Holarctic)
 - Squama with about 4 setae, AR about 1.0 (LEHMANN 1969 figs. 7, 11 a, 17 b)
 - *R. (P.) tirolus* Lehmann (Palearctic)
10. AR 1.4–1.9 11
 - AR 0.9–1.2 12
11. Costal extension long (more than 50 μ m); squama with 16–20 setae; first tarsomere of middle leg with 4–12 sensilla chaetica (Fig. 11; LEHMANN 1969 figs. 2, 13 b, 15 b, 16 a, 18 a)
 - *R. (P.) glabricollis* (Meigen) (Holarctic)
 - Costal extension very short; squama probably with fewer setae and middle leg with fewer sensilla chaetica (LEHMANN figs. 6, 16 c) *R. (P.) gallicus* Lehmann (Palearctic)
12. Ground colour of thorax and part of abdomen yellow to brownish yellow 13
 - Ground colour of thorax and abdomen light brown to black 14

13. Abdomen with segments 1 and 8 or 6–8 yellow with other segments black; thorax yellow with brownish black markings and matt black scutellum (FREEMAN 1956 fig. 5e) *R. (P.) cereofasciatus* (Goetghebuer) (Afrotropical)
- Abdomen all yellow with brownish yellow tergites; thorax slight yellow with brown markings and whitish yellow scutellum (LEHMANN 1969 figs. 8, 19a) *R. (P.) lindbergi* Lehmann (Afghanistan)
14. Scutellum with 4 setae only; costa barely produced (FREEMAN 1956 fig. 5c; LEHMANN 1979 figs. 95–97) *R. (P.) capensis* (Freeman) (Afrotropical)
- Scutellum with 8–10 setae; costal extension moderately long (about 70µm long) (ALBU 1968 fig. 10, LEHMANN 1979 fig. 2, PINDER 1978 figs. 38F, I, 107D) *R. (P.) atripes* (Kieffer)
15. Superior volsella with triangular to tooth-shaped caudomedian projection *effusus* group 16
- Superior volsella bluntly right-angled to rounded 20
16. Humeral pit large and ellipsoid to ovoid; superior volsella with tooth-like projection 17
- Humeral pit small and indistinct (SAETHER 1971 fig. 6C); most of superior volsella form triangular projection (SAETHER 1969 fig. 47, 1971 fig. 8D) *R. (R.) pauciseta* Saether (Nearctic)
17. Squama with 4–13 setae; humeral pit usually divided into very large ellipsoid upper part and smaller parallel ellipsoid lower pit 19
- Squama with 2–5 setae; humeral pit ovoid with a characteristic lower notch 18
18. Inferior volsella with apicomedian tooth-like projection; anal lobe moderately reduced (SASA 1981 figs. 18–19) *R. (R.) tamahumeralis* Sasa (Japan)
- Inferior volsella without apicomedian projection; anal lobe strongly reduced (LEHMANN 1969 figs. 10, 14a, 19b) *R. (R.) nepalensis* Lehmann (Nepal)
19. Anal point with 15–19 setae; AR 1.4–1.6; LR₁ 0.64–0.67, LR₃ 0.51–0.55 (Fig. 18 A–D) *R. (R.) effusoides* spec. nov. (Nearctic)
- Anal point with 5–13 setae; AR 0.9–1.3; LR₁ 0.70–0.74; LR₃ 0.57–0.61 (Fig. 18 E) *R. (R.) effusus* (Walker) (Holarctic)
20. Crista dorsalis weak to absent; AR 0.66–0.97 21
- Crista dorsalis long and low, but distinct to conspicuous; AR 1.00–1.20 22
21. Inferior volsella strongly projecting medially, costa slightly extended (about 30 µm long) (SAETHER 1969 fig. 43, 1971 figs. 6A, 8F) *R. (R.) eminellobus* Saether (Nearctic)
- Inferior volsella not strongly projecting, costa barely extended (15–30 µm long) (Fig. 15, CALDWELL 1984 fig. 2) *R. (R.) tuberculatus* Caldwell (Nearctic)
22. Crista dorsalis conspicuous; costa not or occasionally barely extended; 1–3 sensilla chaetica on hind leg, none on middle leg (Fig. 16) *R. (R.) amplicrostus* spec. nov. (Nearctic)
- Crista dorsalis less conspicuous; costa slightly extended; sensilla chaetica on middle leg, none on hind leg (ALBU 1968 fig. 8; LEHMANN 1969 figs. 4, 12a, 16b) *R. (R.) fuscipes* (Kieffer) (Palearctic)

Key to pupae

1. Tergites without median patch of spinules; frontal setae on prefrons or lacking *Psilocricotopus* 2
- Tergites (III)IV–(V)VI each with one median, rounded patch of spines or strong spinules; frontal setae on frontal apotome *Rheocricotopus* s. str. 7
2. Pedes spurii B absent; L setae of segments V–VIII as 3:3:3–4:4–5 or anal lobe without fringe *chalybeatus* group 3
- Pedes spurii B present on segment II; L setae of segments V–VIII as 4:4:4:4–5; anal lobe always with fringe *atripes* group 5
3. Anal lobe without fringe; only L₁ seta of segment VIII lamelliform, the other setae bristle-like (Fig. 3 B–E) *R. (P.) tirolus* Lehmann (Palearctic)
- Anal lobe with fringe; all L setae of segments VII and VIII lamelliform 4

4. Second dorsocentral (Dc_2) closer to first (Dc_1) than to third (Dc_3); spinules on conjunctives III/IV–V/VI in 3 irregular rows, all anteriorly directed (Fig. 10) *R. (P.) chalybeatus* (Edwards) (Palearctic)
- Dc_2 clearly closer to Dc_3 than to Dc_1 ; spinules on conjunctives III/IV–V/VI in 1–2 irregular rows, usually posteriorly directed on one or more conjunctives (Fig. 7) *R. (P.) robacki* (Beck & Beck) (Nearctic)
5. Caudal spines of tergite VIII long and strong (LEHMANN 1969 fig. 20 d) 6
- Caudal spines of tergite VIII short (LEHMANN 1979 fig. 101)
- *R. (P.) capensis* (Freemann) (Afrotropical)
6. Anal lobe with 14–16 lamelliform setae; exuvia about 3.0–3.5 mm long
- *R. (P.) atripes* (Kieffer) (Palearctic)
- Anal lobe with 22–25 lamelliform setae; exuvia about 5.0–5.7 mm long (Fig. 13)
- *R. (P.) glabricollis* (Meigen) (Holarctic)
7. Pedes spurii B absent; shagreen on tergites very weak with spur of spine patches conspicuously strong; L setae of segments V–VIII as 3:3:3:4–5 (Fig. 14; CALDWELL 1984 figs. 3, 11, 12)
- *R. (R.) tuberculatus* Caldwell (Nearctic)
- Pedes spurii B present on segment II or II and III, but often low; shagreen on tergites relatively extensive, grading over into spinules of spinule patches; L setae of segments V–VIII as 4:4:4:4–5 8
8. Anal lobe with 8–13 lamelliform setae; posterior row of weak spines present on tergite VII and often indicated by spinules on VIII, shagreen of tergites VII and VIII not extensive or absent 9
- Anal lobe with 11–37 lamelliform setae, when less than 14 setae tergites VII–VIII with relatively extensive shagreen and caudal spinules not distinct 11
9. Tergite III with ill-defined median patch of spines (SASA 1981 fig. 20)
- *R. (R.) tamabumeralis* Sasa (Japan)
- Tergite III without median patch of spines 10
10. Anal lobe with 8–12 lamelliform setae; shagreen on tergites VII and VIII present and distinct, but not extensive *R. (R.) eminellobus* Saether (Nearctic)
- Anal lobe with 11–13 lamelliform setae; tergites VII and VIII essentially free of shagreen
- *R. (R.) pauciseta* Saether (Nearctic)
11. Median patch of spinules on tergite IV at most very slightly smaller than that on VI; anal lobe with 11–18 filamentous setae (LEHMANN 1969 fig. 21 b) *R. (R.) effusus* (Walker) (Holarctic)
- Median patch of spinules on tergite IV distinctly smaller than that on VI; anal lobe with 18–37 filamentous setae 12
12. Shagreen of tergite III divided into anteriolateral and posteriomedian patches; patches of spinules relatively well marked out from shagreen spinules; anal lobe with 20–37 setae
- *R. (R.) fuscipes* (Kieffer) (Palearctic)
- Shagreen of tergite III continuous, extensive; patches of spinules especially on tergite IV grading over into shagreen spinules; anal lobe with 18–25 setae (Fig. 20) *R. (R.) effusoides* spec. nov. (Nearctic)

Key to larvae

1. Body setae long and strong, the longest seta more than 100 μm long *Psilocricotopus* subgen. nov. 2
- Body setae short, up to 85 μm long *Rheocricotopus* s. str. 5
2. Median mental teeth each with accessory outer tooth; outer scales of pecten epipharyngis broader than median scale 3
- Median teeth each without accessory tooth, at most with weak outer shoulder; scales of pecten epipharyngis subequal 4
3. Basal antennal segment about 55–63 μm long (CRANSTON 1982 figs. 53 a, c, f, g, i)
- *R. (P.) chalybeatus* (Edwards) (Palearctic)
- Basal antennal segment about 65–69 μm long (Fig. 8) *R. (P.) robacki* (Beck & Beck) (Nearctic)

4. S I split into 6–7 apical teeth; basal antennal segment 96–111 μm long (Fig. 14)
 *R. (P.) glabricollis* (Meigen) (Holarctic)
- S I bifid; basal antennal segment shorter *R. (P.) atripes* (Kieffer)
5. Median mental tooth or teeth each with accessory outer tooth 6
 – Median mental teeth simple or at most with weak outer shoulder 8
6. Mentum with single median tooth, ventromental plates very broad, head capsule with ventral tubercles
 (CALDWELL 1984 figs. 6–10) *R. (R.) tuberculatus* Caldwell
- Mentum with 2 median teeth, ventromental plates less broad and no ventral tubercles on head capsule . . . 7
7. Antennal ratio 1.66–1.94, last antennal segment about 5–6 μm long (CRANSTON 1982 figs. 53 b, d, h) . . .
 *R. (R.) fuscipes* (Kieffer) (Palearctic)
- Antennal ratio about 1.55, last antennal segment about 10 μm long . . . *R. (R.) pauciseta* Saether (Nearctic)
8. About 12–13 setae in beard underneath ventromental plates; AR about 1.1–1.3 (Fig. 17)
 *R. (R.) eminellobus* (Saether) (Nearctic)
- About 25–32 setae in beard underneath ventromental plates; AR 1.5–2.1 9
9. Basal antennal segment about 55–69 μm long; AR 1.5–1.8; cardinal beard of 25–31 setae (CRANSTON 1982
 fig. 53 e) *R. (R.) effusus* (Walker) (Holarctic)
- Basal antennal segment about 70–86 μm long; AR 1.8–2.1; cardinal beard of 32–33 setae (Fig. 21)
 *R. (R.) effusoides* spec. nov. (Nearctic)

Psilocricotopus subgen. nov.

Syn. *Rheocricotopus atripes* group auct.

Type species: *Rheocricotopus atripes* (Kieffer) by present designation.

Diagnostic characters: Male gonostylus with pronounced preapical, more or less triangular crista dorsalis or with apically sharp upward bend; superior volsella relatively small and rounded. Female tergite IX normally undivided, occasionally divided by median fissure. Pupa without spine patches on tergites, but with distinct caudal spines on tergites VII and VIII; frontal setae on prefrons or lacking. Body setae of larvae long, the longest more than 100 μm long. (See also generic diagnosis.)

Etymology: From Greek, *psilos*, bare, smooth; and *Cricotopus*, an orthoclad genus and common ending for several other genera, referring to the bare frontal apotome of the pupa and the lack of median spine patches on the pupal tergites.

godavarius group

Humeral pit of imagines small, appear to consist of partly fused small pits. Immatures not known.

Rheocricotopus (Psilocricotopus) godavarius Lehm.

In the description by LEHMANN (1969: 362) the middle and hind legs probably are mixed. The correct leg ratios apparently should be 0.44 for the middle leg, 0.6 for the hind leg.

Rheocricotopus (Psilocricotopus) conflusirus spec. nov.

(Fig. 2)

Type locality: U.S.A., South Carolina, Oconee Co., Salem, Jocassee Reservoir.

Type material: Holotype, male, Jocassee Reservoir, Salem, Oconee Co., South Carolina, U.S.A., 17/10/75, leg. P. L. Hudson, in coll. Mus. Zool. Univ. of Bergen (ZMBN No. 96).

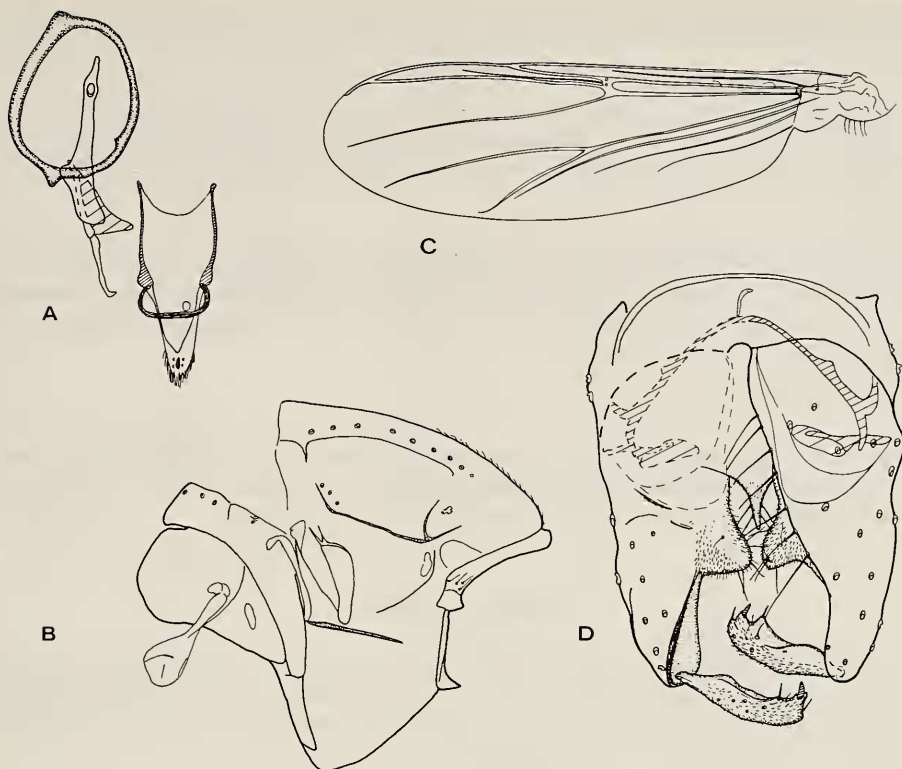


Fig. 2. *Rheocricotopus (Psilocricotopus) conflusirus* spec. nov., male imago: A. Cibarial pump, tentorium and stipes; B. Thorax; C. Wing; D. Hypopygium.

Diagnostic characters: See key on p. 69.

Etymology: From Latin *confluo*, melt, fuse, and *sirus*, pit, referring to the shape of the humeral pit.

Description

Male imago (n=1)

Total length 2.01 mm. Wing length 1.21 mm. Total length/wing length 1.67. Wing length/length of profemur 2.83. Coloration entirely brownish black.

Head. AR 0.58. Ultimate flagellomere 229 μm long. Temporal setae 6, including 3 inner and 3 outer verticals. Clypeus with 10 setae. Cibarial pump, tentorium and stipes as in Fig. 2A. Tentorium 120 μm long, 23 μm wide at sieve pore. Stipes 113 μm long, 30 μm wide. Palp segments length (micrometers): 23, 41, 71, 90, 141. Third palpal segment with 2 sensilla clavata.

Thorax (Fig. 2B). Anteprepronotum with 4 lateral setae. Humeral pit small, apparently consisting of 6 fused holes with sclerotized margins. Dorsocentrals 10, acrostichals about 18, prealars 3. Scutellum with 8 setae.

Wing (Fig. 2C). VR 1.12. Wing membrane with fine punctation of microtrichia visible at 200 \times . Anal lobe very weak. C extension 60 μm long, R₂₊₃ barely visible. R with 2 setae. Squama with 5 setae.

Legs. Spur of front tibia 38 μm long; spurs of middle tibia both 15 μm long, of hind tibia 38 μm and 11 μm long. Width at apex of front tibia 38 μm , of middle tibia 28 μm , of hind tibia 36 μm . Comb with

12 setae, 15–38 μm long. Sensilla chaetica not observed. Lengths (micrometers) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	425	491	293	217	151	99	52	0.60	2.33	3.13	2.0
p ₂	421	430	175	104	80	38	38	0.41	3.95	4.86	×
p ₃	397	468	—	—	—	—	—	—	—	—	—

Hypopygium (Fig. 2D). Anal point 23 μm long, with 5 setae; laterosternite IX with 2 setae. Phallapodeme 49 μm long, transverse sternapodeme 68 μm long. Gonocoxite 165 μm long, with low superior volsella and simple inferior volsella. Gonostylus 60 μm long; crista dorsalis triangular, pointed; megaseta 8 μm long. HR 2.75; HV 3.36.

Remarks

This species is nearly identical to *R. (P.) tamabrevis* Sasa (1983: 74) but differs in having lower LR₁ and fewer setae on the anal point. A larger material is needed of both these species as well as of *R. (R.) godavarius* in order to confirm that the three species not are conspecific.

chalybeatus group

Humeral pit ovoid, circular or square, moderately large to large. Pupa with L setae of segments V–VIII as 3:3:3–4:4–5 or occasionally a fourth vestigial L seta present also on IV and V; pedes spurii B absent. Larva probably always with outer scales of pecten epipharyngis broader than median scale.

Rheocricotopus (Psilocricotopus) tirolus Lehm.

(Fig. 3)

Rheocricotopus tirolus Lehmann, 1969: 359; LANGTON 1984: 100

Material examined: 1 mature male pupa, 1 female pupal exuvia, River Spey, Newtonmore, Scotland, 6/9/82, leg. P. H. Langton; 2 pupal exuvia, Y Gelli (small tributary, about 1 m wide in the catchment of River Usk near the Brecon Bacons), Wales, 9/8/77, leg. R. S. Wilson (PHL, RSW).

Description

Male imago (n = 1)

Although the male is inside its exuvia and wing and legs not measurable, the description by Lehmann can be supplemented in some details:

Coloration brown with darker vittae. Scutellum light in central area. AR 1.00. Ultimate flagellomere 369 μm long. Clypeus with 10 setae. Lengths of first 4 palpomeres (μm): 30, 41, 64, 101. Thorax (Fig. 3A) with 6 anteprenotals, 14 dorsocentrals, 3 prealars, and 8 scutellars. Squama with 4 setae. Anal point with 9 setae, laterosternite IX with 4 setae. Gonocoxite (LEHMANN 1969 fig. 7) 199 μm long. Gonostylus 84 μm long, with 11 μm long megaseta. HR 2.36.

Pupa (n = 4, except when otherwise stated)

Total length 3.40–4.03, 3.67 mm. Length of thoracic horn/length of anal macrosetae 1.52–1.54 in females, 1.57–1.68 in males. Exuvia pale yellowish brown.

Cephalothorax. Frontal seta absent or, on one side of one specimen, 8 μm long, on prefrons (Fig. 3B). Two postorbitals 19–83 μm (3) long; 1 vertical 68 μm (1) long. Median anteprenotals 113–161, 138 μm and 94–113 μm (2) long; lateral anteprenotal 79–101 μm (3) long. Thoracic horn

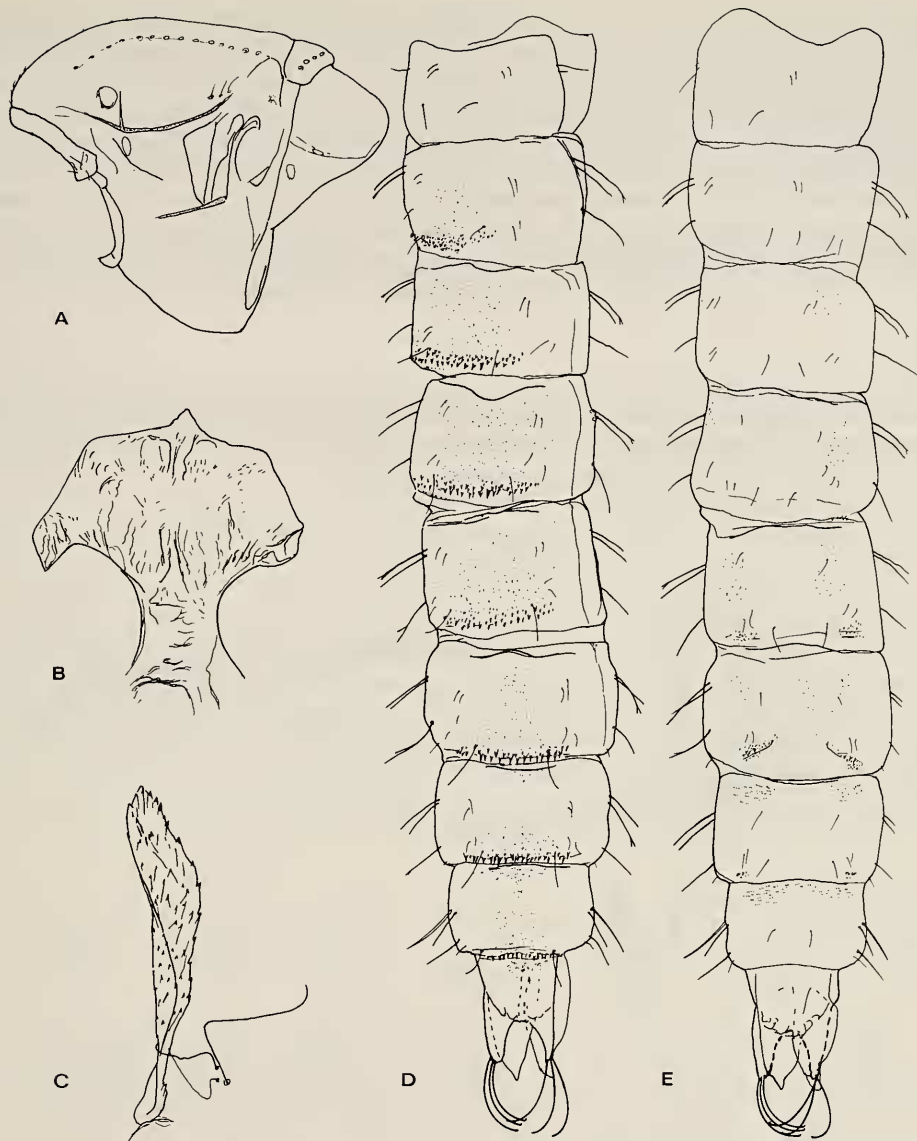


Fig. 3. *Rheocricotopus (Psilocricotopus) tirolus* Lehm.: A. Thorax of male imago; B. Frontal apotome and prefrons of pupae; C. Thoracic horn; D. Pupal tergites; E. Pupal sternites.

(Fig. 3C) 308–341, 326 μm long; 45–64, 54 μm wide. Anterior precorneal seta 131–169, 157 μm long; median seta 75–128, 100 μm long; posterior seta 56–75, 65 μm long. Anterior dorsocentral (Dc_1) 68–98, 79 μm long; Dc_2 75–98, 83 μm long; Dc_3 34–56, 78 μm long; Dc_4 64–71, 68 μm long. Distance between Dc_1 and Dc_2 65–71, 69 μm ; between Dc_2 and Dc_3 21–34, 27 μm ; between Dc_3 and Dc_4 15–23, 19 μm .

Abdomen (Fig. 3D, E). Shagreen absent on tergite I (T I); T II with sparse median shagreen, T III–V with extensive sparse shagreen, T VI with extensive median shagreen; T VII with posteriomedian shagreen, T VIII with anterior and posteriomedian shagreen, T IX with anteriomedian shagreen.

Sternites (S) I–II and IX bare, III–VI with anteriolateral sparse shagreen, VII with anteriolateral group shagreen, S VIII with anterior group shagreen. Pedes spurii A on S IV–VII. Pedes spurii B absent. Male with about 50–59 hooklets, female with 88–100 hooklets on T II. Number of caudal spines on T III–VIII in males as: 50–53, 50–52, 39–42, 37–40, 26–28, 26–27; in females as: 71–74, 73–74, 66–67, 50–58, 38–45, 28–38. Maximal length (micrometers) of caudal spines on T III–VIII as: 15–23, 20; 15–23, 18; 19–30, 24; 26; 19–26, 24. Conjunctives III/IV and IV/V with median spinules in 1–2 rows, absent from conjunctive V/VI. L setae on segments I–VIII as: 3, 3, 3, 3, 3–4, 4, 4, 4; L₄ short or vestigial on V–VIII; other L setae conspicuously long and bristle like, only L₄ of VIII clearly lamelliform. Anal lobe without fringe; anal macrosetae 199–221, 207 µm long. Genital sac of male overreaches anal lobe by 34 µm, with a 11–15 µm long apical tubercle; genital sac of female 68–98 µm short of apex.

Remarks

The identity of these specimens is not fully certain, since the male imago is teneral and the humeral pit appears slightly larger than that figured by LEHMANN (1969 fig. 11a). The legs and wing cannot be measured on this specimen and a comparison with the type material would be of little value. Only a complete rearing can fully confirm the association of the pupa.

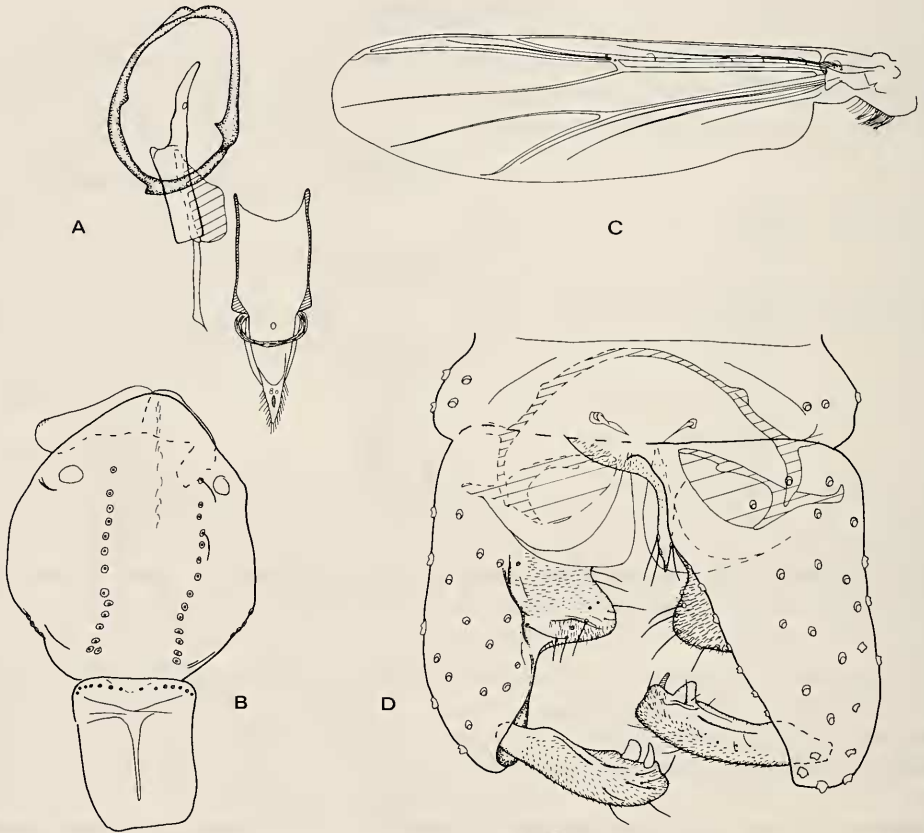


Fig. 4. *Rheocricotopus (Psilocricotopus) chapmani* (Edw.), male imago: A. Cibarial pump, tentorium and stipes; B. Thorax; C. Wing; D. Hypopygium.

Rheocraticopus (Psilocricotopus) chapmani (Edw.)

(Figs. 4, 5)

Spaniotoma (Trichocladius) chapmani Edwards, 1935: 471

Material examined: Holotype, female marked "Type", Lake Fjord, 66.17N, 34.59W, East Greenland, 16/8/33, leg F. S. Chapman (BM 1933-635). Paratypes: 5 females, as holotype (BMNH); 2 males, 4 females, Malaise trap, Blesbekken, Kongsvoll, Oppdal, Sør-Trøndelag, Norway, 31/7, 9/8 and 15/8/82, J. O. Solem (BMNH, RNSSL, ZMBN).

Diagnostic characters. The egg-shaped humeral pit, the extended costa, the high number of squamal setae, the coloration, and the leg ratios will separate the species from other members of the genus.

Description

Male imago (n = 2)

Total length 2.85–3.23 mm. Wing length 1.80–2.02 mm. Total length/wing length 1.59–1.60. Wing length/length of profemur 2.63–2.64. Coloration dark brown with conspicuous clear, narrowly ovoid humeral pit.

Head. AR 1.18–1.29. Ultimate flagellomere 435–501 μm long. Temporal setae of 5 outer verticals. Clypeus with 20–22 setae. Cibarial pump, tentorium and stipes as in Fig. 4A. Tentorium 173 μm long, 34–38 μm wide. Stipes 165–169 μm long, 41–56 μm wide. Palp segments length (micrometers): 38–41, 64–75, 124–128, 139–143, 195–218. Third palpal segment with 2–3 sensilla clavata at apex.

Thorax (Fig. 4B). Anteprepronotum with 6–7 lateral setae. Humeral pit moderately large, completely egg-shaped, distinct. Dorsocentrals 14–17, acrostichals 17–19, prealars 4. Scutellum with 14 setae.

Wing (Fig. 4C). VR 1.07–1.10. Wing membrane with punctuation of microtrichia distinctly visible at 100 \times . Anal lobe projecting. C extension 41–53 μm long. R with 5–7 setae. Squama with 13–22 setae.

Legs. Spur of front tibia 53–56 μm long; spurs of middle tibia 21–23 μm and 19 μm long; of hind tibia 51–60 μm and 19–23 μm long. Width at apex of front tibia 43 μm , of middle tibia 43–45 μm , of hind tibia 49–53 μm . Comb of 13–14 setae, shortest seta 30 μm long, longest seta 51–60 μm long. Sensilla chaetica apparently absent. Lengths (micrometers) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	685–765	751–841	553–586	284–298	208–217	142	76–80
p ₂	685–756	671–756	331–359	161–175	123–128	76	66–71
p ₃	699–784	799–898	454–510	250–255	198–213	104–118	76–80
	LR	BV	SV	BR			
p ₁	0.70–0.74	2.81–2.97	2.60–2.74	2.2–2.6			
p ₂	0.48–0.49	3.97–4.17	4.10–4.21	2.5–2.6			
p ₃	0.57	3.11–3.29	3.30	3.7–4.4			

Hypopygium (Fig. 4D). Anal point 45 μm long, with 4–10 setae, laterosternite IX with 5 setae. Phallapodeme 86–90 μm long, transverse sternapodeme 90–94 μm long. Gonocoxite 206–214 μm long, with low superior volsella and simple inferior volsella. Gonostylus 94–98 μm long, crista dorsalis bluntly triangular, megaseta 13–15 μm long. HR 2.19–2.20, HV 3.04–3.30.

Female imago (n = 10, except when otherwise stated)

Total length 2.03–2.81, 2.40 mm. Wing length 1.39–1.95, 1.66 mm (9). Total length/wing length 1.38–1.53, 1.45 (9). Wing length/length of profemur 2.72–2.96, 2.80 (9). Coloration blackish brown with black confluent vittae and conspicuous clear humeral pit.

Head. Flagellomere lengths (micrometers, n = 4): 60–79, 70; 45–56, 52; 45–58, 51; 43–62, 51; 83–105, 95 (9). AR 0.41–0.45, 0.43 (7). Temporals 5–13, 7; including 1–4, 2 inner verticals; and 4–9, 6

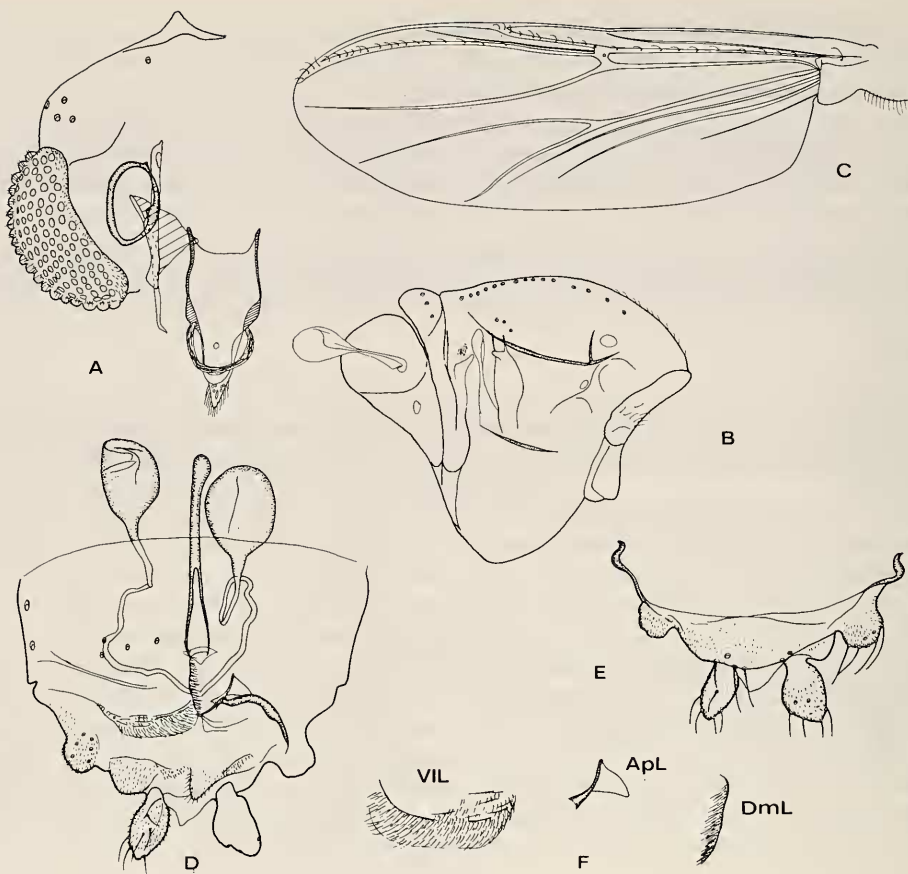


Fig. 5. *Rheocricotopus (Psilocricotopus) chapmani* (Edw.), female imago: A. Cibarial pump, tentorium and stipes; B. Thorax; C. Wing; D. Genitalia, dorsal view; E. Genitalia, ventral view; F. Lobes of gonapophysis VIII (DmL, dorsomesal lobe; VIL, ventrolateral lobe; ApL, apodeme lobe).

outer verticals. Clypeus with 10–25, 16 setae. Cibarial pump, tentorium and stipes as in Fig. 5A. Tentorium 143–188, 164 μm (9) long; 13–19, 17 μm wide. Stipes 124–176, 147 μm long; 41–60, 50 μm wide. Palp segments length (micrometers): 30–49, 42; 45–71, 59; 86–120, 102; 98–150, 128 (9); 173–244, 206 (7). Third palpal segment with 1 median and 3 ventrolateral sensilla clavata at apex. Coronal suture usually only indicated by dark line, present in 4 specimens length 19–56 μm .

Thorax (Fig. 5B). Anteprenotum with 6–10, 8 lateral setae. Dorsocentrals 12–29, 16; acrostichals 11–16, 13; prealars 3–4, 3. Scutellum with 8–13, 10 setae. Humeral pit 38–68, 52 μm long; 26–45, 36 μm wide; one specimen on one side with 30 μm long, 53 μm wide pit.

Wing (Fig. 5C). VR 1.05–1.09, 1.07 (9). Anal lobe relatively well developed but not projecting. Wing membrane with fine punctation of microtrichia visible at 100 \times . C extension 75–116, 98 μm long. Brachiolum with 1 seta; R with 9–16, 10 (9) setae; R₁ with 5–11, 8 (9); R₄₊₅ with 8–20, 14 (9); and C extension with 4–8, 6 (9) nonmarginal setae. Squama with 10–21, 15 (9) setae.

Legs. Spur of front tibia 24–36, 28 μm (8) long; spurs of middle tibia 19–24, 22 μm (8) and 17–19, 19 μm (8) long; of hind tibia 38–58, 47 μm (9) and 15–23, 19 μm long. Width at apex of front tibia 34–49, 41 μm (8); of middle tibia 38–49, 43 μm (8); of hind tibia 41–60, 50 μm . Comb with 11–13, 13 se-

tae; shortest seta 23–30, 26 μm long; longest 34–50, 42 μm long. Sensilla chaetica 10–22, 15 (9) at 0.10–0.20, 0.15 (9) to 0.56–0.80, 0.65 (9) of ta_1 of middle leg; 6–17, 11 (8) at 0.16–0.24, 0.20 (8) to 0.39–0.64, 0.53 (8) of ta_1 of hind leg. Lengths (micrometers) and proportions of legs:

	fe (n = 8–9)	ti (n = 8–10)	ta_1 (n = 8–9)	ta_2 (n = 7–8)	ta_3 (n = 5–9)	ta_4 (n = 5–8)	ta_5
p_1	473–701, 584	567–813, 665	369–493, 477	146–236, 189	142–184, 167	85–113, 97	66–71, 67
p_2	510–718, 627	515–723, 629	246–340, 280	104–161, 118	76–113, 84	52–71, 66	52–66, 58
p_3	515–747, 637	610–846, 718	321–425, 364	161–227, 185	132–189, 155	71–95, 80	57–66, 64

	LR (n = 8–10)	BV (n = 5–8)	SV (n = 8)	BR (n = 8–10)
p_1	0.63–0.65, 0.64	3.00–3.27, 3.18	2.82–3.05, 2.95	1.4–2.1, 1.7
p_2	0.45–0.48, 0.46	4.01–4.48, 4.27	4.17–4.45, 4.32	1.7–2.5, 1.9
p_3	0.51–0.55, 0.53	3.28–3.62, 3.44	3.44–3.63, 3.54	2.0–3.1, 2.5

Abdomen. Number of setae on tergites I–VIII as (n = 9): 10–26, 17; 17–40, 24; 15–30, 22; 13–22, 18; 13–28, 17; 10–20, 14; 7–15, 12; 10–24, 16. Number of setae on sternites I–VIII as: 0; 0–2, 2; 2–4, 3; 2–10, 5; 5–11, 7; 6–14, 9; 6–11, 9; 6–12, 8. No median setae on sternites I–IV.

Genitalia (Fig. 5E–F). Gonocoxite with 12–21, 16 setae; including 8–11, 9 strong and 4–10, 6 weak setae. Tergite IX undivided except in one specimen from Norway; with 8–13, 11 setae. Cercus 62–94, 79 μm long. Seminal capsule excluding neck 83–94, 88 μm (9) long; 64–83, 69 μm (7) wide; with 15–23, 20 μm (6) long neck. Notum 83–128, 106 μm long.

Remarks

R. chapmani is much darker than *R. tirolus*. However, the darker coloration may be connected with the higher latitude. The females from Norway have 18–21 setae on squama, 5–8 setae on R_1 , 8–10 on R_{4+5} , and 14–17 sensilla chaetica on hind leg; while the females from Greenland have 10–17 setae on squama, 7–11 setae on R_1 , 14–20 on R_{4+5} , and 6–10 sensilla chaetica on hind leg. Equally large variations, however, are found in other species and there seems to be no doubt about the conspecificity. As in *R. (P.) chalybeatus* tergite IX of the female may sometimes be slightly divided.

Rheocricotopus (Psilocricotopus) robacki (Beck & Beck)

(Figs. 6, 7, 8)

Tricocladius robacki Beck & Beck, 1964: 204

Rheocricotopus kenorensis Saether, 1969: 88; 1971 fig. 6B; syn. nov.

Material examined: Paratype, male reared from larva, Clay Co., Florida, U.S.A., 18/2/63, W. M. Beck Jr. (FSCA); Paratype of *R. kenorensis*, male, fast flowing stream, between miles 18 and 19 on Mando logging road, Kenora, Ontario, Canada, 22/8/67, A. L. Hamilton and O. A. Saether (CNC. No 9989); 19 males, 1 larva, Upper Three Runs Creek, Savannah River Plant, (SRP „F“), Aiken Co., South Carolina, U.S.A., 18–19/9/76; 2/2/77, 11/3/77 and 29/3/77, 16/2/79, 31/3/79, 11/5/79, 7/8/79 and 20/8/79; 30/3/80, 13/4/80, 24/4/80, 1/7/80 and 17/10/80, P. L. Hudson; 5 males, Lower Three Runs Creek, Savannah River Plant, Aiken Co., South Carolina, 31/3/79, 21/8/79, 1/10/79, 18/3/80, P. L. Hudson; 2 males, 2 larvae, Mill Creek, Savannah River Plant, 17/5/77, 28/6/77, 12/5/80, 30/7/80; 3 males, Tinker Creek, Savannah River Plant, Aiken Co., South Carolina, 19/9/76, 19/11/76 and 29/5/80, P. L. Hudson; 1 mature female pupa, Seneca Creek, Hwy 123, Oconee Co., South Carolina, 22/10/77, P. L. Hudson; 1 pupal exuvia, West Prong, Pigeon River, Gatlinburg, Sevier Co., Tennessee, 3/5/77, P. L. Hudson, 1 male reared from larva, South River, Albert Shoals, Dekalb Co., Georgia, 23/10/79, B. A. Caldwell (ANSP, BMNH, CNC, USNM, ZMBN, ZMS).

Description

Male imago

The species is described in sufficient detail by BECK & BECK (1964) and SAETHER (1969, 1971). In addition can be mentioned: Scutellum with paler central area. AR of examined specimen 1.00–1.33. Squama

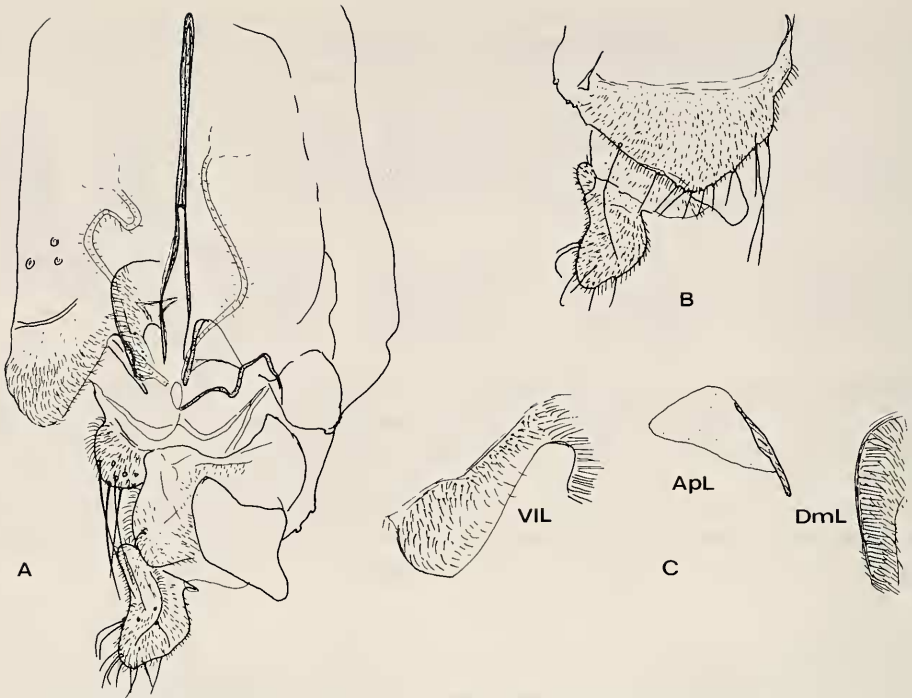


Fig. 6. *Rheocricotopus (Psiloricotopus) robacki* (Beck & Beck), female imago, genitalia: A. Dorsal view; B. Ventral view; C. Lobes of gonapophysis VIII (DmL, dorsomesal lobe; VIL, ventrolateral lobe; ApL, apodeme lobe).

with 5–10 setae. Sensilla chaetica present on ta_1 of middle leg with 1–3 at 0.15–0.16 to 0.20–0.27. Anal point (SAETHER 1969 fig. 44, as *R. kenorensis*) with 6–11 setae.

Female imago ($n = 1$, based on mature female pupa)

Head. Flagellomeres length (micrometers): 45, 34, 38, 38, 90. AR 0.59. Ultimate palpal segment 146 μm long.

Thorax. Antepre-notum with 4 lateral setae. Dorsocentrals 9, prealars 3. Scutellum with 8 setae.

Wing. R with 6 setae, R_1 with 7 and R_{4+5} with 7 setae. Squama with 11 setae.

Abdomen. Number of setae on tergites II–VIII as: 16, 14, 16, 17, 12, 6, 8. Number of setae on sternites III–VIII as: 2, 2, 2, 8, 6, 7.

Genitalia (Fig. 6). Gonocoxite with 13 setae, including 7 strong and 6 weak setae. Tergite IX undivided, with 6 strong and 8 very small setae. Cercus 81 μm long. Notum 105 μm long.

Other details not measureable.

Pupa ($n = 3$)

Total length 2.83–4.17 mm. Length of thoracic horn/length of anal macrosetae 0.50–0.80. Exuvia greyish brown, relatively dark.

Cephalothorax. Frontal setae on prefrons (Fig. 7A), 15–19 μm long. Median antepre-notals 169 μm and 101–113 μm long, lateral antepre-notal 45–56 μm long. Thoracic horn, 165–259 μm long, 41–68 μm wide, one specimen normal on one side (Fig. 7B); abnormal on other side (Fig. 7C), 68 μm long, 34 μm wide. Anterior precorneal seta 98–143 μm long, median 75–94 μm long, posterior 150–154 μm long and stronger. Anterior dorsocentral (Dc_1) 41–83 μm long, Dc_2 30–56 μm long, Dc_3

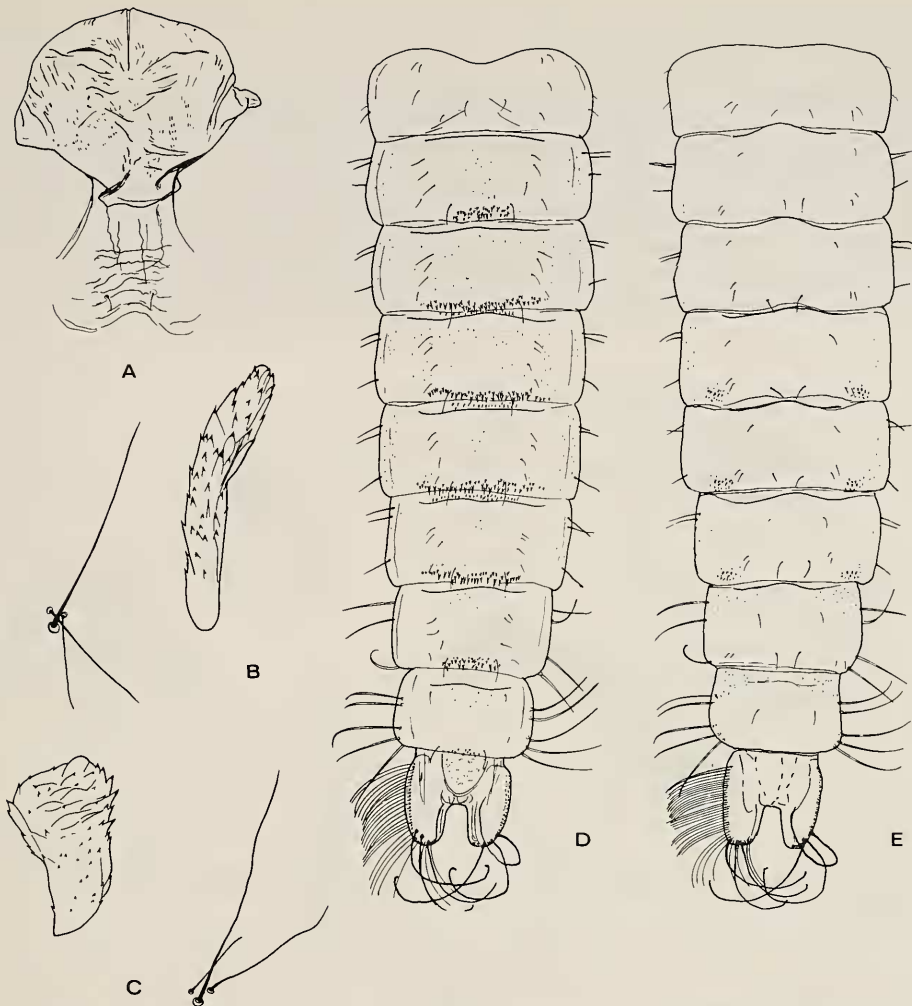


Fig. 7. *Rheocricotopus (Psilocricotopus) robacki* (Beck & Beck), pupa: A. Frontal apotome and prefrons; B. Normal thoracic horn; C. Abnormal thoracic horn; D. Tergites; E. Sternites.

19–53 μm long, Dc_4 45 μm long. Distance between Dc_1 and Dc_2 68–79 μm , between Dc_2 and Dc_3 23–28 μm , between Dc_3 and Dc_4 19–41 μm .

Abdomen (Fig. 7D). Tergite I (T I) bare; T II with sparse median and lateral shagreen; T III–IV with extensive, but sparse; T V–VI with median, posterior and lateral; T VII–VIII with anterior; T IX with median shagreen. Sternite I (S I) and S IX bare, S II–III with posteriolateral, S IV–VI with lateral, and S VII–VIII with anteriolateral shagreen. Pedes spurii A on S IV–VI. Pedes spurii B absent. T II with about 50–60 caudal hooklets. Number of caudal spines on T III–VIII as: 48–68, 55–62, 55–62, 35–43, 26–45, 10–30 (vestigial). Maximal length (micrometers) of caudal spines on T III–VIII as: 19–23, 19–23, 23–34, 26–34, 11–24, 4–6. Conjunctives III/IV to V/VI with relatively strong spinules in 1–2 rows, variably anteriorly or posteriorly directed. L setae on segments I–VIII as: 2, 3, 3, 3, 3, 3, 3–4, 5; all L setae lamelliform on segments VII and VIII, bristle-like on anterior segments. Anal lobe with 26–29 setae in fringe; anal macrosetae 319–330 μm long.

Larva (n=2, both associated larval exuvia)

Head capsule length 0.40–0.41 mm.

Head. Antenna as in Fig. 8A. Lengths of antennal segments (micrometers): 66–69, 14–23, 5–7, 6–7, 6–7. AR 1.56–1.71. Basal antennal segment 17–19 μm wide, distance from base to ring organ 2–9 μm , to basal mark of seta 6 μm , to distal mark 33 μm . Lauterborn organs 6 μm long. Blade 28–31 μm long, accessory blade 14 μm long. Labrum and epipharyngeal area about as in *R. chalybeatus* (CRANSTON 1982 fig. 53c), with outer scales of pecten epipharyngis broader than median scale. Premandible 62–71 μm long. Mandible (Fig. 8B) 121–124 μm long. Maxilla as in Fig. 8C. Mentum as in Fig. 8D, ventromental plate 14–19 μm wide, with 16 setae underneath. Postmentum 225 μm long.

Abdomen. Longest body setae 169 μm long. Posterior part of abdomen lost.

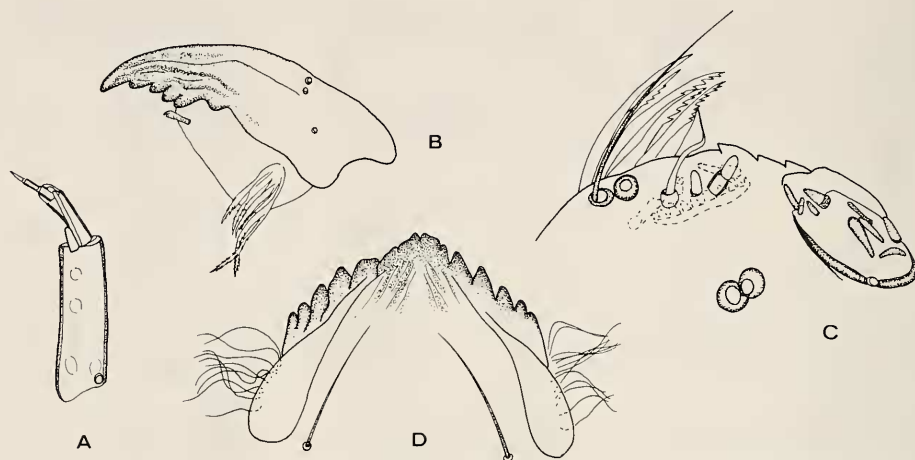


Fig. 8. *Rheocricotopus (Psilocricotopus) robacki* (Beck & Beck), larva: A. Antenna; B. Mandible; C. Maxilla; D. Mentum.

Remarks

R. robacki is remarkably similar to *R. chalybeatus* in all stages except for the “normal” male gonostylus. The hind tibia carries the normal 2 apical spurs not 1 spur as wrongly stated by BECK & BECK (1964: 204).

Rheocricotopus (Psilocricotopus) chalybeatus (Edw.)

(Figs. 9, 10)

Spaniotoma (Trichocladius) chalybeatus Edwards, 1929: 331

Eukiefferiella urbanus Goetghebuer, 1932: 101

Trichocladius leruthi Goetghebuer, 1939: 2

Rheocricotopus chalybeatus (Edw.); LEHMANN 1969: 354, HIRVENOJA 1973: 340; LANGTON 1984: 98

Material examined: Lectotype, male, canal nr. Watford, Herts., England, 21/8/16, F. W. Edwards 19/6–192, by present designation (BMNH). Other material, male reared from larva, River Teign near Clayford, Devon, England, 3/6/78, P. S. Cranston; female reared from pupa, River Lea, Letty Green, Hertfordshire, England, 8/5/76, P. S. Cranston; female, misidentified paralectotype of *Chironomus glabricollis* Meigen (see p. 86), July–Aug., coll. Meigen (BMNH, MNHN, ZMBN).

Description

Male imago (n = 2, except when otherwise stated)

The redescription given by LEHMANN (1969: 354) can be supplemented in some details: Ultimate flagellomere 364 μm (1) long. Temporal setae 3–5, including 1 inner and 2–4 outer verticals. Palp segments length (micrometers): 30–38, 49–56, 79–96, 94–116, 131–233. Third palpal segment with 1 lanceolate sensillum clavatum at apex. Anteprepronotum with 4 lateral setae. Dorsocentrals 10–14, prealars 3–4. Scutellum with 8 setae. VR 1.13. Wing membrane with fine punctation of microtrichia visible at 125 \times . Costa extension 0–15 μm . R with 2–4 setae. Squama with 8–14 setae. LR₁ 0.62–63, LR₂ 0.51 (1), LR₃ 0.56–0.57. Sensilla chaetica 5 (1) at 0.12–0.26 of ta₁ of middle leg, none on hind leg. Hypopygium as in LEHMANN (1969 fig. 1) and PINDER (1978 figs. 38C, 117A). Anal point with 8–9 setae.

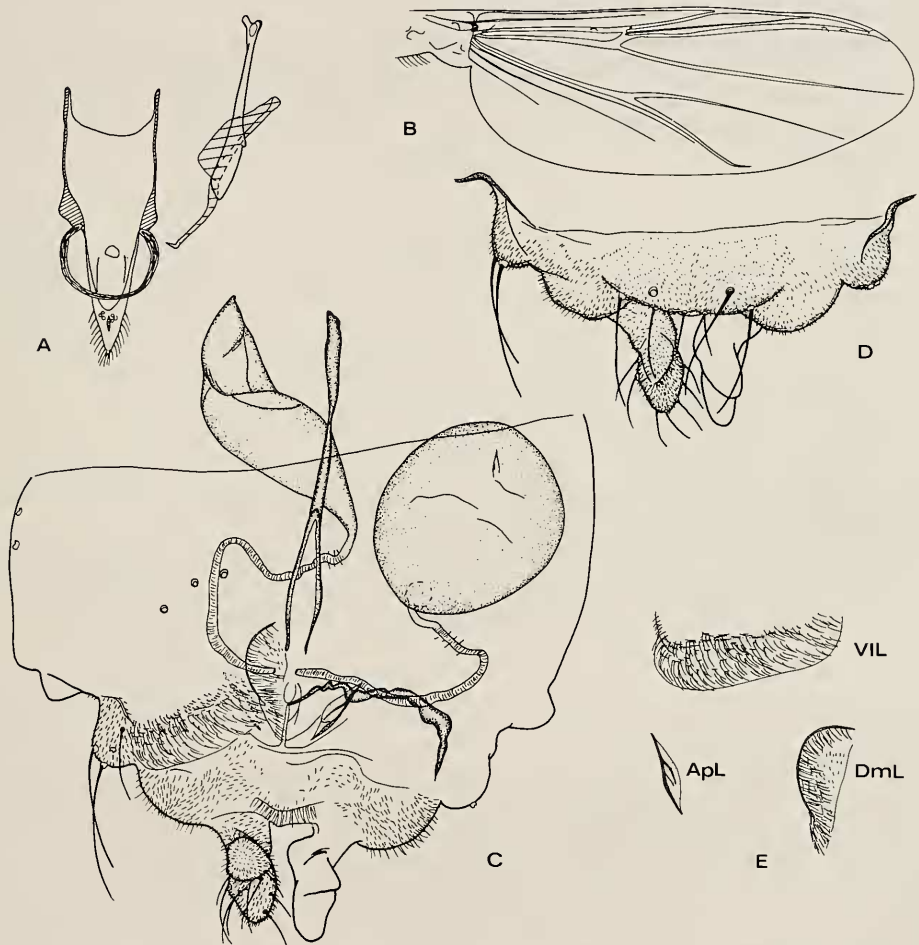


Fig. 9. *Rheocricotopus (Psilocricotopus) chalybeatus* (Edw.), female imago: A. Cibarial pump, tentorium and stipes; B. Wing; C–E. Genitalia, dorsal (C) and ventral (D) aspect and lobes of gonapophysis VIII (E) (DmL, dorsomesal lobe; VIL, ventrolateral lobe; ApL, apodeme lobe).

Female imago (n=2, except when otherwise stated)

Total length 2.10–2.17 mm. Wing length 1.29–1.39 mm. Total length/wing length 1.63–1.65. Wing length/length of profemur 2.78–2.87. Coloration blackish brown.

Head. Flagellomeres length (micrometers): 53, 30, 41, 45, 90. AR 0.55. Temporals 3–5, including 1 inner and 2–4 outer verticals. Clypeus with 12–14 setae. Cibarial pump, tentorium and stipes as in Fig. 9A. Tentorium 135–143 μm long, 15–19 μm wide. Stipes 124–154 μm long, 30 μm (1) wide. Palp segments length (micrometers): 30–38; 45–49, 79; 90(1); 165(1). Sensilla clavata not observable. Coronal suture absent.

Thorax. Anteprenotum with 4 lateral setae. Dorsocentrals 10–16, prealars 3. Scutellum with 8–10 setae. Humeral pit as in male (LEHMANN 1969 fig. 12b).

Wing (Fig. 9B). VR 1.10–1.14. Wing membrane with punctation of microtrichia visible at 125 \times . Costa not extended. Brachiolum with 1 seta, R with 7–8 setae, R_1 with 1–8, and R_{4+5} with 3–6 setae. Squama with 7–11 setae.

Legs. Spur of front tibia 26–34 μm long, spurs of middle tibia 15–19 μm and 11 μm long, of hind tibia 38–41 μm and 15–19 μm long. Width at apex of front tibia 34–39 μm , of middle tibia 38–39 μm , of hind tibia 41–43 μm . Comb of 11–12 setae, 23–41 μm long. Sensilla chaetica 7–8 at 0.10–0.12 to 0.29–0.36 on ta_1 of middle leg, 4 (1) at 0.16–0.33 (1) on ta_1 of hind leg. Lengths (micrometers) and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p_1	458–463	558	321	170–189	132–137	85–90	57–61
p_2	444–454	454–482	227	104	76–85	38–47	43–52
p_3	444–473	558–567	302–321	161 (1)	132 (1)	57 (1)	57 (1)
	LR	BV	SV	BR			
p_1	0.58	2.81–3.01	3.16–3.18	1.8			
p_2	0.47	4.03–4.33	3.96–4.13	1.7–2.3			
p_3	0.54–0.57	3.35 (1)	3.22–3.24	2.3			

Abdomen. Number of setae on tergites I–VIII; 16–21, –, 10–14, 9–11, 9–10, 9, 8–11, 11–15. Number of setae on sternites I–VIII: 0(1), 2(1), 2(1), 3–6, 6–8, 4–7, 4–5, 6–8.

Genitalia (Fig. 9C, D, E). Gonocoxite with 7–8 setae, including 4 strong and 3–4 weak setae. Tergite IX at least sometimes divided by median fissure, with 8 setae. Cercus 60–86 μm long. Seminal capsules 135–158 μm long, 79 μm (1) wide, neck triangular 23–26 μm long. Notum 99–116 μm long.

Pupa (n=2)

Total length 3.04–3.24 mm. Length of thoracic horn/length of anal macrosetae 0.53–0.72. Exuvia greyish brown, relatively dark.

Cephalothorax. Frontal setae on prefrons (Fig. 10A), 30–34 μm long. Median anteprenotals 113–169 μm and 68–94 μm long; lateral anteprenotal 56–64 μm long. Postorbitals 23–30 μm and 34–45 μm long, vertical 30–45 μm long. Thoracic horn (Fig. 10B, LANGTON 1984 fig. 32a) 176–229 μm long, 30–34 μm wide. Anterior precorneal seta 101–120 μm long; median seta strong, 143–169 μm long; posterior seta 60–83 μm long. Anterior dorsocentral (Dc_1) 60–71 μm long, Dc_2 49–60 μm long, Dc_3 30–53 μm long, Dc_4 41–60 μm long. Distance between Dc_1 and Dc_2 23–41 μm , between Dc_2 and Dc_3 60–68 μm , between Dc_3 and Dc_4 30–45 μm .

Abdomen (Fig. 10C, D; LANGTON 1984 fig. 32a). Tergite I (T I) bare; T II–V nearly bare, with indication of lateral spinules; T VI–VIII with sparse median shagreen; T IX with anterior shagreen. Sternites I (S I) and IX bare, S II–V with sparse anteriomedian and lateral shagreen, S VI–VIII with median and lateral shagreen. Pedes spurii A present on S IV–VI. Pedes spurii B absent. T II with about 90–100 caudal hooklets. Number of caudal spines on T III–VIII as: 56–70, 49–58, 46–53, 35, 24–25, 12–27.

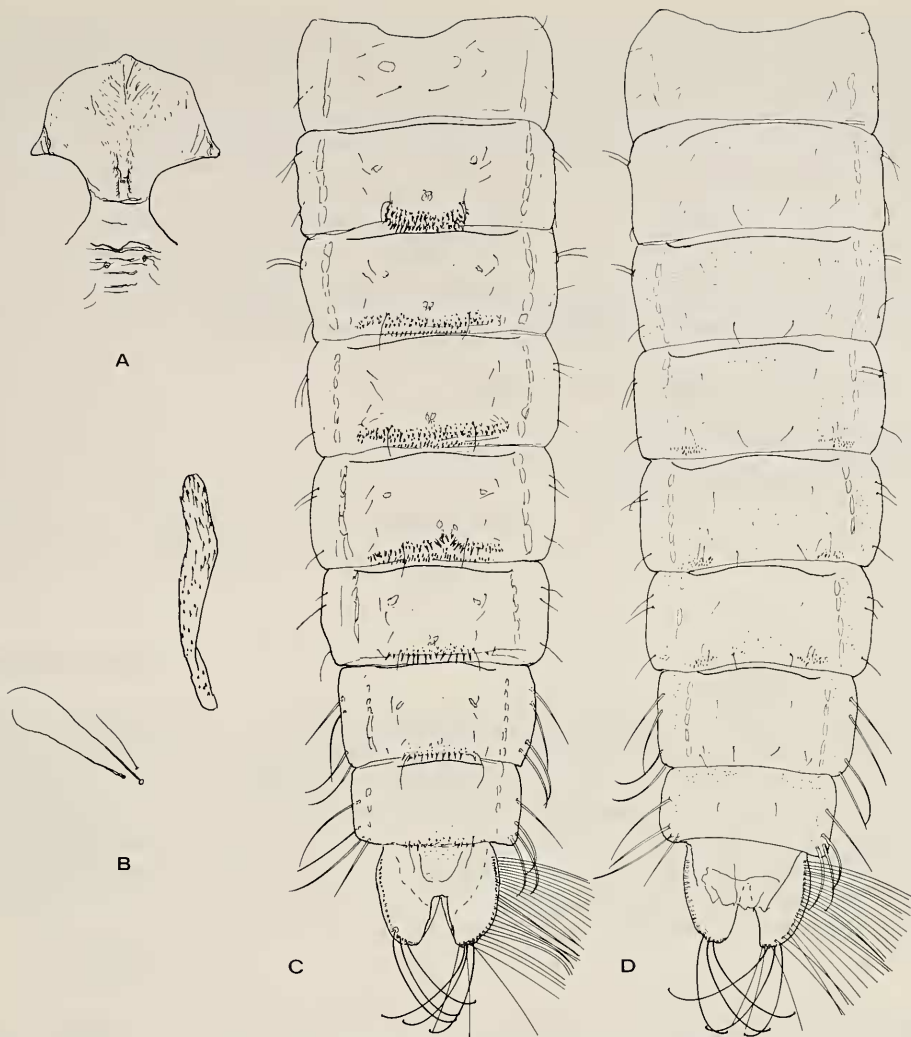


Fig. 10. *Rheocricotopus (Psilocricotopus) chalybeatus* (Edw.), pupa: A. Frontal apotome and prefrons; B. Thoracic horn; C. Tergites; D. Sternites.

Maximal length (micrometers) of caudal spines on T III–VIII as: 19–23, 23, 23–26, 26–34, 19–26, 4–11. Conjunctives III/IV to V/VI each with 2–3 rows of anteriorly directed spinules. L setae on segments I–VIII as: 2, 3, 3, 3, 3, 4, 4–5; all lamelliform on segments VII and VIII. Anal lobe with 25–26 (19–26 in LANGTON 1984: 98) setae in fringe, anal macrosetae 319–330 μm long. Genital sac of female 94 μm short of apex of anal lobe, genital sac of male not measurable.

Larva

The larva is described by CRANSTON (1979: 301, 1982: 130).

Remarks

R. chalybeatus is remarkable similar to *R. robacki*. Also in *R. robacki* there is a tendency to an upward bend of the apex of the gonostylus. *R. chalybeatus* does have a triangular crista dorsalis, but it is

moved near apex. In the pupa, in addition to the difference mentioned in the key, the shagreen is weaker in *R. chalybeatus*. The humeral pit of *R. chalybeatus* is nearly as large as in the *atripes* group and at least some females have divided tergite IX. Especially the females thus may be difficult to identify. However, only *R. robacki* and *R. chalybeatus* have costal extension lacking combined with distinct humeral pits.

atripes group

Humeral pit very large, nearly rectangular. Pupa with L setae of segments V–VIII as 4:4:4:4–5, pedes spurii B present. Larval pecten epipharyngis consisting of 3 subequal scales.

Rheocricotopus (Psilocricotopus) atripes (Kieff.)

Cricotopus atripes Kieffer, 1913: 22

Spaniotoma (Trichocladius) foveatus Edwards, 1929: 330

Trichocladius iridipennis Storå, 1945: 25

Material examined: 1 male, River Fulda, West Germany, 28/5/69, J. Lehmann (as *R. foveatus*) (ZMBN).

Description

Male imago (n = 1)

The redescriptions given by ALBU (1968: 464) and LEHMANN (1969: 352, as *R. foveatus*) can be supplemented in some details:

Ultimate flagellomere 482 µm long. Temporal setae 4, all outer verticals. Clypeus with 10 setae. Tentorium 165 µm long, 30 µm wide at sieve pore. Stipes 150 µm long, 53 µm wide. Palp segments length (micrometers): 38, 64, 128, 143, 248. Third palpal segment with 2 median sensilla clavata. Antep pronotum with 4 lateral setae. Dorsocentrals 11, prealars 4. Scutellum with 8 setae. VR 1.04. Wing membrane with fine punctuation of microtrichia visible at 250×. C extension 68 µm long. R with 8 setae. Squama with 6 setae. LR₁ 0.80, LR₂ 0.56, LR₃ 0.59. Sensilla chaetica 2 at 0.13–0.29 on ta₁ of middle leg, none on hind leg. Hypopygium as in ALBU (1968 fig. 10), LEHMANN (1969 fig. 2) and PINDER (1978 figs. 38 F, I, 117D), all as *R. foveatus*. Anal point with 5 setae.

Pupa

According to LEHMANN (1969: 354) and HIRVENOJA (1973: 340) the pupae of *R. atripes* are nearly identical to those of *R. glabricollis* (as *R. gouini* [Goetgh.]). LANGTON (1984: 98, fig. 32c), however, includes 2 reared and associated pupae in his key. These pupae differ clearly from *R. glabricollis* in having a smaller size (length of exuviae 3.2 mm and 3.3 mm, length of thoracic horn 275 µm and 300 µm) and fewer setae in the fringe (14 and 16) than in *R. glabricollis*.

Larva

CRANSTON (1982: 132) includes *R. atripes* in his key based on a single specimen from a Welsh stream. The larva is smaller than *R. glabricollis* and has a bifid S I as opposed to several apical teeth in *R. glabricollis*.

Rheocricotopus (Psilocricotopus) glabricollis (Meig.)

(Figs. 11–14)

Chironomus glabricollis Meigen, 1830: 248

Paratrichocladius ornaticollis Santos Abreu, 1918: 54

Cricotopus boiemicus Kieffer, 1922: 148

Trichocladius gouini Goetghebuer, in GOUIN 1936: 170

Spaniotoma (*Psectrocladius*) sp. A JOHANNSEN, 1937: 68, syn. nov.

Trichocladius extatus Roback, 1957: 84, syn. nov.

Material examined: Lectotype, male (here designated) of *Chironomus glabricollis* Meigen (MNHN). Paralectotypes, 3 males, 2 females of *Chironomus glabricollis* Meigen (only 1 male belongs to *R. (P.) glabricollis* while one male belongs to *R. (R.) effusus* [Edw.]; 1 male, 1 female to *Paratrichocladius rufiventris* [Meig.]; and 1 female to *R. (P.) chalybeatus* [Edw.]). Holotype, female, of *Trichocladius extatus* Roback, ANSP No. 6792, mounted on 2 slides, 26B (ROBACK 1957: 9) nr. Springhouse along Rose Glen Road, Gladwyne, Pennsylvania, U.S.A., 17-23/6/53, S. S. Roback; paratypes, mature male pupa (allotype), as holotype; mature female pupa, mature male pupa with larval exuvia; other material, 1 pupa with larval exuvia, 1 pupa, 3 larvae, as holotype; 2 larvae, 24A (ROBACK 1957: 8), small unnamed stream on Schuylkill impounding basin near Abrams, Pennsylvania, U.S.A., 15/6/53, S. S. Roback; pupa, Red Clay Creek, Yorklyn, Pennsylvania, U.S.A., 23/7/56, S. S. Roback (ANSP). One male, female of *R. glabricollis* sensu Edwards, Snailbeack, Salop, England, 22-28/7/30, F. W. Edwards (1920-277) (BMNH). Two males, as *R. gouini* in SAETHER (1983: 58), light-trap, 1¼ miles off McCreavy Island, Lake Winnipeg, Manitoba, Canada, 15/7/69, S. S. Chang (ZMBN). Four males with pupae and larvae, 3 females with pupae and larvae, 3 pupae reared from larvae, 4 pupae, 1 larva, small stream, Booker Springs Road, Clemson, Pickens Co., South Carolina, 22/2/83, 1/3/83 and 7/3/83, P. L. Hudson; 2 males, 8 females, 18 Mile Creek, Clemson, Pickens Co., South Carolina, U.S.A., 1/1/80, 1-25/1/81, 18/9/81 and 10/3/82, P. L. Hudson; 1 male, Hudson's bathroom, Clemson, South Carolina, U.S.A., 12/4/80, P. L. Hudson; 1 male, Chatooga River, Mountula Rest, Oconee Co., South Carolina, 14/4/74, P. L. Hudson; 1 female, Le Conte Creek, Gatlinburg, Sevier Co., Tennessee, 4/5/80, P. L. Hudson (CNC, USNM, ZMBN, ZSM).

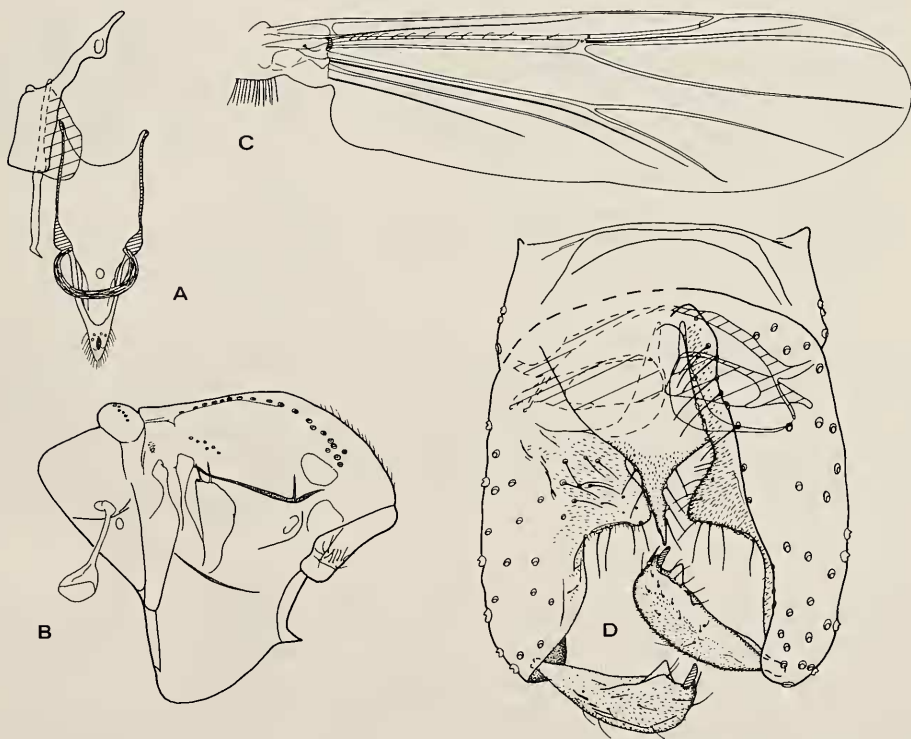


Fig. 11. *Rheocricotopus* (*Psilocricotopus*) *glabricollis* (Meig.), male imago: A. Cibarial pump, tentorium and stipes; B. Thorax; C. Wing; D. Hypopygium.

Description

Male imago (n = 7–8, except when otherwise stated)

Total length 2.93–3.90, 3.52 mm. Wing length 1.63–2.34, 2.06 mm. Total length/wing length 1.61–1.80, 1.69. Wing length/length of profemur 2.40–2.55, 2.51. Coloration pale brown to dark brown with blackish brown to black confluent or separate vittae and markings and dark scutellum.

Head. AR 1.45–1.77, 1.62 (10). Ultimate flagellomere 524–718, 629 μm (10) long. Temporal setae 5–8, 8; including 1–3, 2 inner and 3–6, 6 outer verticals. Clypeus with 11–17, 15 (9) setae. Cibarial pump, tentorium and stipes as in Fig. 11A. Tentorium 195–219, 204 μm long; 38–45, 42 μm wide. Stipes 158–188, 174 μm long; 38–56, 51 μm wide. Palp segments length (micrometers): 38–53, 45; 64–90, 76; 109–143, 123; 150–197, 167; 210–274, 235. Third palpal segment with 4–6, 5 sensilla clavata at apex.

Thorax (Fig. 11B, LEHMANN 1969 fig. 13b). Anteprenotum with 8–13, 10 lateral setae. Humeral pit very large, rectangular. Dorsocentrals 15–26, 19; acrostichals 11–19, 14; prealars 4–8, 5. Scutellum with 12–16, 14 setae.

Wing (Fig. 11C, LEHMANN 1969 fig. 16A). VR 1.04–1.09, 1.06. Wing membrane with fine punctation of microtrichia visible at 200 \times . Anal lobe slightly projecting. C extension 53–116, 82 μm long. R with 6–13, 9 (9) setae. Squama with 12–24, 16(9) setae.

Legs. Spur of front tibia 53–75, 62 μm long; spurs of middle tibia 19–26, 23 μm and 17–24, 21 μm (6) long; of hind tibia 51–71, 63 μm and 19–24, 21 μm long. Width at apex of front tibia 47–54, 52 μm ; of middle tibia 45–56, 49 μm ; of hind tibia 49–64, 58 μm . Comb of 12–14, 13 setae; shortest seta 26–38, 32 μm long; longest seta 53–71, 60 μm long. Sensilla chaetica 4–12, 7(5) at 0.07–0.11, 0.09 (4) to 0.21–0.42, 0.33 (4) on ta_1 of middle leg; 0–2, 1(4) at 0.21–0.44 (2) on ta_1 of hind leg. Lengths (micrometers) and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p ₁	680–917,818	784–1049,925	680–907,792	340–444,385	255–321,280	189–227,204	80–104,93
p ₂	652–819,781	651– 898,795	388–529,464	170–236,210	123–175,154	61–104,82	47– 76,64
p ₃	652–888,789	803–1139,997	501–699,612	246–340,296	198–274,238	104–151,126	66– 90,78

	LR	BV	SV	BR
p ₁	0.84–0.89,0.85	2.47–2.73,2.63	2.15–2.32,2.20	1.8–2.4,2.1
p ₂	0.57–0.59,0.58	3.83–4.21,4.02	3.36–3.46,3.41	2.5–2.7,2.6
p ₃	0.61–0.62,0.62	3.14–3.47,3.24	2.89–2.97,2.93	3.3–4.7,4.0

Hypopygium (Fig. 11D; LEHMANN 1969 fig. 2, PINDER 1978 figs. 38G, J, 118). Anal point 45–62, 58 μm long; with 6–8, 7 setae; laterosternite IX with 4–7, 5 (10) setae. Phallapodeme 68–94, 82 μm (9) long; transverse sternapodeme 75–101, 91 μm long, not measurable in 2 additional specimens because of irregularly developed oral projections. Gonocoxite 210–263, 244 μm (10) long, with low superior volsella and simple inferior volsella. Gonostylus 94–113, 104 μm (10) long; crista dorsalis pointed and triangular; megaseta 11–19, 14 μm (10) long. HR 2.22–2.47, 2.35 (10); HV 3.12–3.87, 3.38.

Female imago (n = 7, except when otherwise stated)

Total length 2.23–3.57, 2.82 mm. Wing length 1.61–2.29, 2.07 mm. Total length/wing length 1.28–1.67, 1.37. Wing length/length of profemur 2.41–2.63, 2.54. Coloration brownish yellow to dark brown with lower to black confluent or separate vittae and dark scutellum.

Head. Flagellomeres length (micrometers): 94–116, 113; 75–90, 85; 64–83, 73; 60–79, 68; 79–116, 101 (8). First flagellomere partly divided in one specimen from South Carolina. AR 0.28–0.32, 0.29 (8). Temporals 9–18, 14 (8); including 2–6, 3 (8) inner verticals; and 7–12, 10 (8) outer verticals. Clypeus with 15–22, 17 setae. Cibarial pump, tentorium and stipes as in Fig. 12A. Tentorium 169–221,

156 μm long; 21–30, 25 μm wide. Stipes 150–188, 174 μm (8) long; 38–68, 52 μm wide. Palp segments length (micrometers): 38–53, 46 (8); 56–75, 67 (8); 94–124, 112 (8); 128–176, 153; 221–270, 249 (6). Third palpal segment with 5 ventrolateral and 2 median sensilla clavata at apex. Coronal suture absent except in holotype of *R. extatus* where it is 98 μm long.

Thorax. Anteprenotum with 13–21, 16 lateral setae. Dorsocentrals 20–34, 25; acrostichals 10–22, 15 (6); prealars 4–7, 5. Scutellum with 12–18, 16 setae.



Fig. 12. *Rheocricotopus (Psilocricotopus) glabricollis* (Meig.), female imago: A. Cibarial pump, tentorium and stipes; B. Wing; C-E. Genitalia, dorsal (C) and ventral (D) aspect and lobes of gonapophysis VIII (E) (DmL, dorsomesal lobe; VIL, ventrolateral lobe; ApL, apodeme lobe).

Wing (Fig. 12B). VR 1.04–1.09, 1.07. Wing membrane with fine punctation visible at 200 \times . Anal lobe not projecting. C extension 109–154, 138 μ m long. Brachiolum with 1 seta; R with 14–23, 19 setae; R₁ with 8–13, 11; R₄₊₅ with 16–27, 21; and C extension with 5–8, 7 nonmarginal setae. Squama with 18–25, 21 setae.

Legs. Spur of front tibia 17–36, 29 μ m long; spurs of middle tibia 15–26, 21 μ m (4) and 15–19, 17 μ m (5) long; of hind tibia 45–64, 59 μ m and 15–23, 22 μ m (6) long. Width at apex of front tibia 24–60, 51 μ m; of middle tibia 45–60, 53 μ m; of hind tibia 49–73, 64 μ m. Comb with 12–15, 13 setae; shortest seta 26–38, 32 μ m long; longest seta 56–68, 62 μ m long. Sensilla chaetica 26–49, 36 at 0.09–0.15, 0.11 (5) to 0.85–0.91, 0.87 (5) on ta₁ of middle leg; 26–41, 36 (6) at 0.10–0.15, 0.13 (6) to 0.85–0.91, 0.85 (6) on ta₁ of hind leg. Lengths (micrometers, n = 6–7) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	652–888, 813	747– 983, 909	553–756, 692	274–359, 332	208–274, 257	151–198, 178	76–95, 85
p ₂	605–832, 764	628– 780, 779	340–473, 422	151–217, 188	104–156, 136	61– 85, 78	47–71, 64
p ₃	605–822, 766	747–1035, 952	444–647, 576	227–312, 281	180–265, 231	90–128, 113	66–85, 78

	LR	BV	SV	BR
p ₁	0.74–0.79, 0.76	2.75–2.93, 2.85	2.42–2.55, 2.48	1.6–2.0, 1.8
p ₂	0.52–0.55, 0.54	4.04–4.32, 4.22	3.57–3.81, 3.67	1.6–1.9, 1.7
p ₃	0.59–0.63, 0.60	3.13–3.35, 3.24	2.86–3.05, 2.96	2.0–3.4, 2.6

Abdomen. Number of setae on tergites I–VIII as: 33–46, 40 (5); 40–58, 48; 30–50, 42; 30–47, 39; 25–36, 33; 20–34, 28; 19–33, 24; 19–25, 23. Number of setae on sternites I–VIII as: 0; 2–4, 2; 2–8, 5; 4–8, 7; 7–12, 10; 9–17, 12; 12–18, 15; 8–16, 13. No median setae on sternites I–IV.

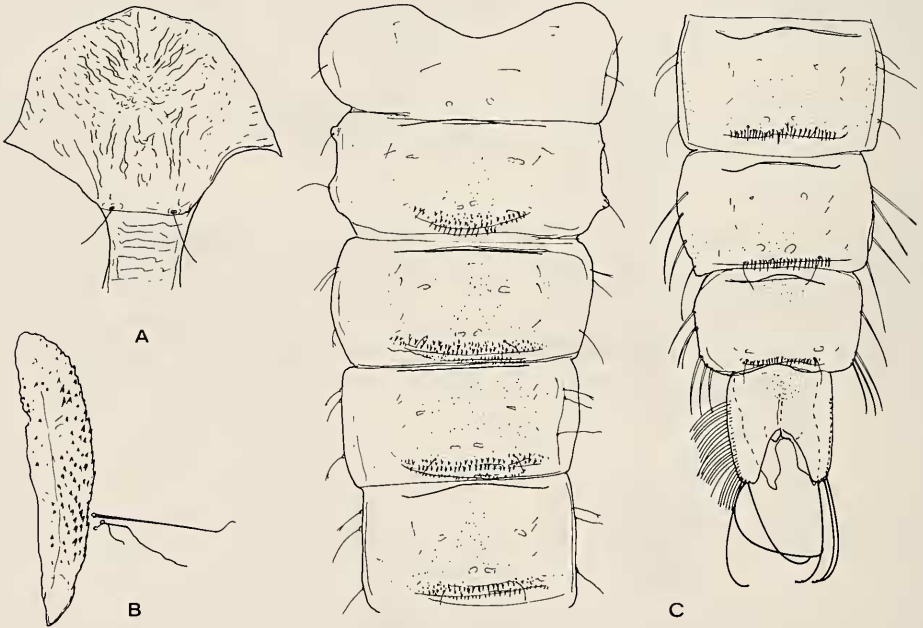


Fig. 13. *Rheocricotopus (Psilocricotopus) glabricollis* (Meig.), pupa: A. Frontal apotome and prefrons; B. Thoracic horn; C. Tergites.

Genitalia (Fig. 12C–E). Gonocoxite with 16–19, 17 setae; including 11–13, 12 stronger and 5–7, 5 weaker setae. Tergite IX undivided; with 8–14, 12 setae. Cercus 69–114, 93 μm long. Seminal capsule excluding weak or not developed neck 68–90, 80 μm long; 49–71, 59 μm (6) wide. Notum 105–135, 124 μm long.

Pupa (n = 2, except when otherwise stated)

Total length 5.48–5.67 mm. Length of thoracic horn/length of anal macroseta 1.03–1.11. Exuvia brown.

Cephalothorax. Frontal setae 23 μm (1) long; on prefrons (Fig. 13A). Median anteprenotals 176–188 μm and 113–131 μm long; lateral anteprenotal 56–68 μm long. One postorbital observed, 41 μm (1) long. Thoracic horn (Fig. 13B) 401–465 μm (3) long; 86–94 μm (3) wide. Anterior precorneal seta 165–214 μm long, median seta 49–113 μm (3) long, posterior seta 90–158 μm (3) long. Anterior dorsocentral (Dc_1) 113–154 μm long, Dc_2 45–49 μm long, Dc_3 45–68 μm (3) long, Dc_4 75–98 μm long. Distance between Dc_1 and Dc_2 94–143 μm , between Dc_2 and Dc_3 43–45 μm , between Dc_3 and Dc_4 19–26 μm (3).

Abdomen (Fig. 13C). Tergite I (T I) bare, T II with sparse median and lateral shagreen, T III–IV with extensive but sparse, T V–VII with posteriormedian and lateral, and T VIII and IX with anterior shagreen. Shagreen on sternites not observable on specimens. Pedes spurii A on S III–VI, weak on III. Pedes spurii B present on segment II. T II with about 190 (1) caudal hooklets. Number of caudal spines on T III–VIII as: 66–110, 85–119, 66–80, 55–61, 50, 35 (1). Maximal length (micrometers) of caudal spines on T III–VIII as: 19–23, 23–30, 23–26, 34–38, 23–26, 26 (1). Conjunctives III/IV–V/VI with rows of anteriorly directed spinules. L setae on segments I–VIII as: 2, 3, 3, 4, 4, 4, 4, 4–5; all lamelli-

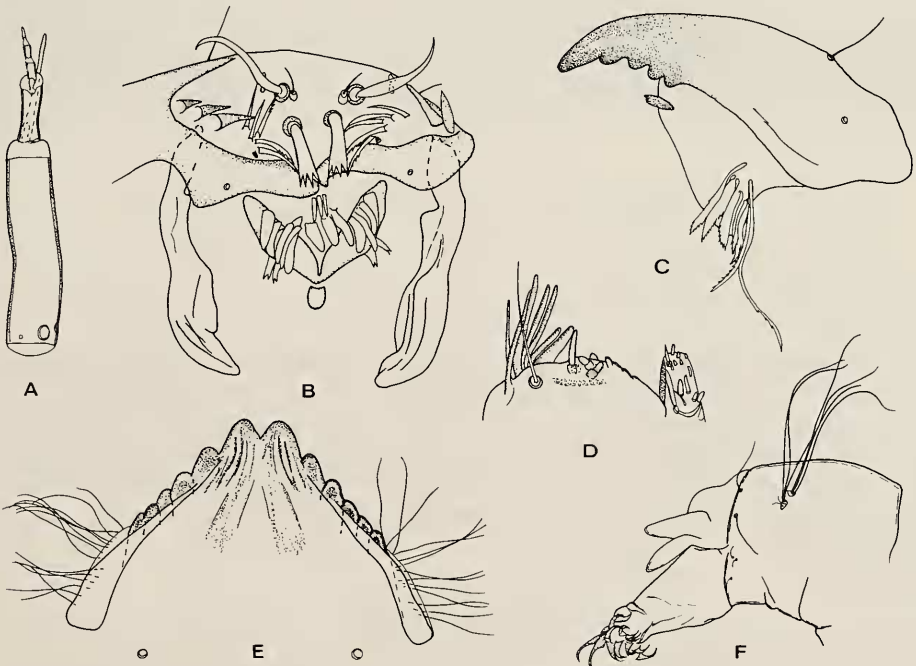


Fig. 14. *Rheocricotopus (Psilocricotopus) glabricollis* (Meig.), larva: A. Antenna; B. Labrum and epipharyngeal area; C. Mandible; D. Maxilla; E. Mentum; F. Posterior end of abdomen.

form on T VII and VIII, some split on T II–V. Anal lobe with 22–25, 24 (4) setae in fringe; anal macrosetae 360–473 μm (3) long. Genital sac of male overreaching anal lobe by 38 μm (1).

Larva (n = 5, except when otherwise stated)

Total length 7.1–9.4, 8.3 mm (4). Head capsule length 662 μm (2).

Head. Antenna as in Fig. 14A. Lengths of antennal segments (micrometers): 96–111, 101; 26–30, 27; 8–11, 9; 7–9, 8; 7–9, 8. AR 1.79–2.00, 1.90. Basal antennal segment 24–26, 24 μm wide; distance from base to ring organ 4–9, 7 μm ; to basal mark of seta 4–13, 8 μm ; to distal mark of seta 53–68 μm (2); blade 43–49, 46 μm long; accessory blade 19–24, 21 μm long. Lauterborn organ 8–11, 10 μm long. Labrum and epipharyngeal area as in Fig. 14B; with S I split into 6–7, 6 apical teeth; and scales of pecten epipharyngis subequal. Premandible 86–99, 94 μm long. Mandible (Fig. 14C) 173–184, 176 μm long. Maxilla as in Fig. 14D. Mentum (Fig. 14E) with 2 median teeth 18–19, 19 μm wide, without accessory lateral teeth, occasionally slightly lighter than remaining teeth; ventromental plates 17–19, 18 μm wide; with 15–21, 20 setae underneath. Postmentum 198–274, 266 μm long.

Abdomen (Fig. 14F). Procercus 38–45, 43 μm high; 30–34, 32 μm wide; with median and basal spurs; anal setae 548–624, 584 μm long. Supraanal seta 132–180, 157 μm long. Length of supraanal seta/length of anal seta 0.23–0.30, 0.27. Posterior parapods 416–567, 495 μm long. Anal tubules 181–281, 244 μm long; 60–71, 68 μm (4) wide medially.

Remarks

This species is the largest of all species of *Rheocricotopus*, but shows a large variation in size. There are no differences between European and Nearctic specimens, except that the tibial spurs appear slightly longer in European males and the specimens perhaps a bit darker. The larvae according to GOUIN (1936 fig. 18, as *R. gouini*) have pale median teeth on the mentum. These, however, are not mentioned in the description. Some of the examined larvae have slightly lighter median teeth. The majority, however, has dark teeth and it is most likely, that the figure by Gouin is incorrect. The S I of the larva has 6–7 apical teeth. However, in some specimens setae anteriores appear to be bifid with each branch split into 3–4 apical teeth. It is never palmate as stated by ROBACK (1957: 84) and leading SAETHER (1970: 99) to place the species in *Psectrocladius*.

Rheocricotopus subgen. Rheocricotopus

Syn. *Rheocricotopus fuscipes* group auct.

Type species: *R. effusus* Walk. (see p. 103)

Diagnostic characters: Male gonostylus with rounded and elongated, but sometimes prominent crista dorsalis or crista dorsalis absent; superior volsella prominent, bluntly right-angled or with caudomesal triangular or tooth-like projection. Female tergite IX completely and distinctly divided into two setigerous protrusions except in *R. (R.) tuberculatus* where the division is less distinct. Pupa with median patches of spines or spinules on tergites, without distinct caudal spines on tergites VII and VIII; frontal setae short, but distinct, on frontal apotome. Body setae of larvae relatively short, the longest less than 85 μm long.

tuberculatus group

Superior volsella rounded without caudomesal projection. Humeral pit small. Female tergite IX only weakly divided. Pupa with unhooked macrosetae. Larvae with single median mental tooth and tubercles on head capsule.

***Rheocricotopus (Rheocricotopus) tuberculatus* Caldwell**

(Fig. 15)

Rheocricotopus tuberculatus Caldwell, 1984: 84

Material examined: 3 males reared from pupae, National Fish Hatchery, Chatooga River, Oconee Co., South Carolina, U.S.A., 9/3/78, P. L. Hudson; 3 pupal exuvia as above except: 15/2/76; 1 male reared from pupa, 1 male, as above except: East Fork, Chatooga River, 9/3/78 and 28/3/82; 1 mature male pupa, 1 female reared from pupa, 1 pupa reared from larva, 1 larva, Spring B, Issaqueena Forest, Clemson Univ., Pickens Co., South Carolina, 6/3-27/4/82, P. L. Hudson; 1 male reared from larva, 1 male, 1 mature male pupa reared from larva, spring, Booker Springs Road, Pickens Co., South Carolina, 1/3-7/4/82, P. L. Hudson (BAC, BMNH, CNC, USNM, ZMBN, ZSM).

Description

The specimens from South Carolina differ slightly from those described by CALDWELL (1984: 84) from Georgia and the description by Caldwell can be supplemented in some details:

Male imago (n = 7, except when otherwise stated)

Ultimate flagellomere 265-368, 324 μm long. AR 0.66-0.95, 0.78. Cibarial pump, tentorium and stipes as in Fig. 15A. Tentorium 120-165, 148 μm long; 26-36, 29 μm wide. Stipes 101-158, 130 μm long; 30-45, 35 μm wide. Third palpal segment with 1 lanceolate sensillum clavatum. Costal extension 15-30 μm (3) long. Hind leg with 1-2, 1 (4) sensilla chaetica at 0.16-0.30 (3) on ta_1 of hind leg. Hypopygium as in Fig. 15C. Anal point 15-45, 33 μm (9) long; with 4-8 setae; laterosternite IX with 3-4, 4 (9) setae.

Female imago (n = 1)

AR 0.45. Tentorium 128 μm long, 11 μm wide. Coronal suture absent. Costal extension 45 μm long. R with 10 setae, R_1 with 7, R_{4+5} with 22 and C extension with 3 nonmarginal setae. Squama with 7 setae. Sensilla chaetica 2 at 0.22-0.43 of ta_1 of mid leg, 6 at 0.21-0.44 on ta_1 of hind leg. Sternite VIII with 12 setae. Gonocoxite IX with 4 strong and 7 weak setae. Tergite IX with 8 setae. Labia with distinct microtrichia.

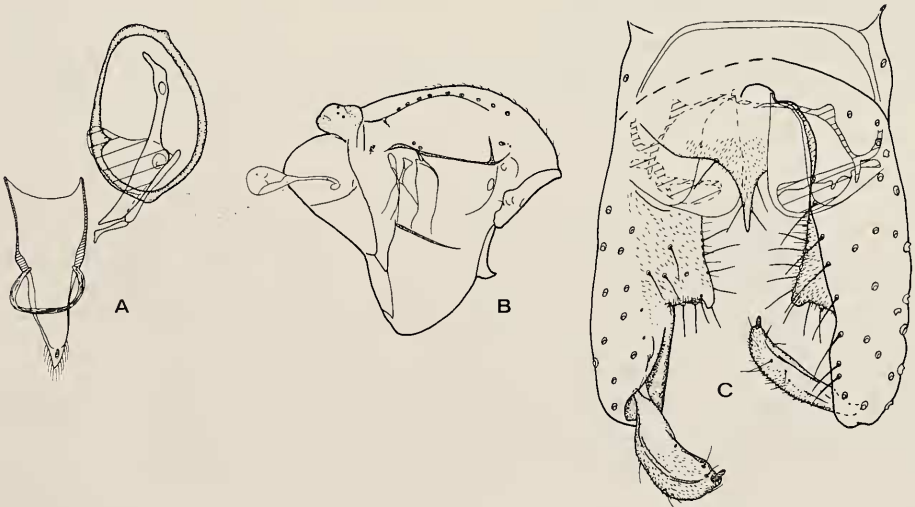


Fig. 15. *Rheocricotopus (Rheocricotopus) tuberculatus* Cald., male imago: A. Cibarial pump, tentorium and stipes; B. Thorax; C. Hypopygium.

Pupa (n = 9–10, except when otherwise stated)

Pupa with thoracic horn (CALDWELL 1984 fig. 11) 233–274, 258 μm long; 34–56, 51 μm wide. Distance between anterior dorsocentral (Dc_1) and Dc_2 41–90, 63 μm , between Dc_2 and Dc_3 15–41, 28 μm ; between Dc_3 and Dc_4 45–86, 71 μm . Tergite II with about 70–140, 100 caudal hooklets. Number of caudal spines on T III–VI approximately as: 45–90, 70; 55–90, 75; 55–105, 80; 30–70, 45. Maximal length of spines (micrometers) as: 19–23, 20; 19–26, 22; 19–30, 25; 23–36, 30. Number of spines in spine patches on T IV–VI as: 0–20, 7; 10–30, 19; 20–44, 35. Maximal length (micrometers) of spines as: 21–34, 25 (6); 15–38, 27; 23–38, 31. Anal lobe with 15–22, 19 setae in fringe, anal macrosetae 169–251, 212 μm long, without the normally hooked apex. Genital sac of male overreaching anal lobe by 53–109, 75 μm (4); with a 15–44, 28 μm (4) long apical papilla.

Remarks

The male of *R. tuberculatus* is quite similar to that of *R. eminellobus*. The female is unique among known females of *Rheocricotopus* in possessing microtrichia on the labia and in having less distinctly divided tergite IX. The pupa, however, differs distinctly from all other described pupae of the genus by its strong spines in the spine patches, the weak shagreen and the un-hooked anal macrosetae. Also the larva (CALDWELL 1984) with its distinctive ventral tubercles on the larval head capsules, its single median tooth and very large ventromental plates differs from all other members of the genus.

fuscipes group

Superior volsella bluntly right-angled, without caudomesal projection. Humeral pit small. Tergite IX of female well divided.

Rheocricotopus (*Rheocricotopus*) *fuscipes* (Kieff.)

Cricotopus fuscipes Kieffer, 1909: 45

Cricotopus sordicola Kieffer, 1912: 87

Cricotopus sordicola var. *fuscithorax* Kieffer, 1913: 32

Cricotopus sordicola var. *discolor* Kieffer, 1913: 33

Cricotopus dispar Goetghebuer, 1913: 151

Trichocladius sylvaticus Goetghebuer, 1937: 274

Material examined: 1 male, River Fulda, Hessen, West Germany, 13/4/67, J. Lehmann: (ZMBN).

Description

Male imago (n = 1)

The redescrptions given by ALBU (1968: 462) and LEHMANN (1969: 355, as *R. dispar*) can be supplemented in some details: Ultimate flagellomere 614 μm long. Temporal setae 5, including 1 inner and 4 outer verticals. Clypeus with 10 setae. Tentorium 165 μm long, 38 μm wide at sieve pore. Stipes 154 μm long. Palp segments length (micrometers): 38, 68, 135, 120, 214. Third palpal segment with 1 sensillum clavatum. Antep pronotum with 4 lateral setae. Dorsocentrals 4, prealars 3. Scutellum with 8 setae. VR 1.15. Wing membrane with fine punctuation of microtrichia visible at 250 x. C extension 41 μm long. R with 4 setae. Squama with 7 setae. LR_1 0.73, LR_2 0.53, LR_3 0.59. Sensilla chaetica 2 at 0.20–0.31 on ta_1 of middle leg, none on hind leg. Hypopygium as in ALBU (1968 fig. 8), LEHMANN (1969 fig. 4) and PINDER (1978 fig. 38D, 117B), all as *R. dispar*. Anal point with 5 setae.

Pupa

The pupa is redescrbed by LEHMANN (1969: 356) and LANGTON (1984: 96, fig. 31b).

Larva

The larva is redescribed by CRANSTON (1979: 305, 1982: 130).

Rheocricotopus (Rheocricotopus) amplicristatus spec. nov.

(Fig. 16)

Type locality: U.S.A., South Carolina, Aiken Co., Upper Three Runs Creek.

Type material: Holotype, male, Upper Three Runs Creek, Savannah River Plant SRP 8-1, Aiken Co., South Carolina, U.S.A., 11/3/77, leg. P. L. Hudson, in coll. Mus. Zool. Univ. of Bergen (ZMBN No. 97). Paratypes, 5 males, 26/2/77, 11/3/77, 13/4/80 and 24/4/80, otherwise as for holotype (BMNH, CNC, USNM, ZMBN).

Diagnostic characters: See key on p. 69.

Etymology: From Latin, *ampli*, larger, and *cristatus*, crested, referring to the prominent crista dorsalis.

Description

Male imago (n = 6, except when otherwise stated)

Total length 2.27–2.62, 2.43 mm. Wing length 1.21–1.52, 1.35 mm. Total length/wing length 1.73–1.87, 1.80. Wing length/length of profemur 2.75–2.92, 2.83. Coloration pale brown with confluent dark brown vittae and thoracic markings, scutellum with pale central area.

Head. AR 1.00–1.14, 1.06. Ultimate flagellomere 375–424, 389 μm long. Temporal setae 3–5, 4; including 1–2, 1 inner and 2–4, 3 outer verticals. Clypeus with 6–11, 9 setae. Cibarial pump, tentorium and stipes as in Fig. 16A. Tentorium 131–148, 139 μm (5) long; 23–30, 27 μm (5) wide at sieve pore.

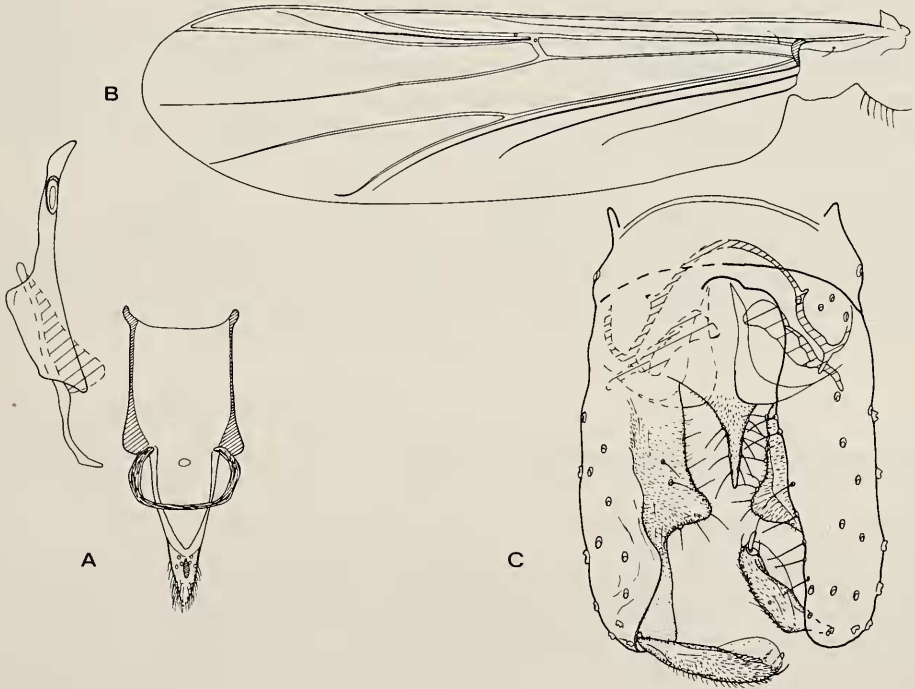


Fig. 16. *Rheocricotopus (Rheocricotopus) amplicristatus* spec. nov., male imago: A. Cibarial pump, tentorium and stipes; B. Wing; C. Hypopygium.

Stipes 109–120, 114 μm (5) long; 28–34, 32 μm (5) wide. Palp segments length (micrometers): 23–32, 27; 34–41, 38; 68–79, 73; 75–98, 89; 128–154, 136. Third palpal segment with 1 lanceolate sensillum clavatum at apex.

Thorax. Antepnotum with 4 (4) lateral setae. Humeral pit consisting of small fused pits. Dorsocentrals 4–6, 5; acrostichals 2–5, 3 (5) when only 2 high up on scutum; prealars 2 (5). Scutellum with 4–6, 5 setae.

Wing (Fig. 16B). VR 1.11–1.18, 1.14. Wing membrane with fine punctuation of microtrichia visible at 200 \times . Anal lobe slightly projecting. Costal extension 0–19, 6 μm long. Cu_1 slightly sinuate. R with 1–5, 2 setae. Squama with 6–9, 7 setae.

Legs. Spur of front tibia 41–45, 42 μm long; spurs of middle tibia 19–23, 21 μm and 15–21, 17 μm long, of hind tibia 38–45, 41 μm and 11–19, 16 μm long. Width at apex of front tibia 28–32, 30 μm ; of middle tibia 28–34, 31 μm ; of hind tibia 32–39, 35 μm . Comb with 9–12, 10 setae; shortest seta 19–26, 22 μm long; longest seta 34–45, 41 μm long. Sensilla chaetica not observed on middle leg, 1–3 at 0.18–0.22, 0.20 (5) to 0.24–0.32 (3) on ta_1 of hind leg. Lengths (micrometers) and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p_1	444–520,476	491–600,541	359–416,382	260–293,270	184–198,191	113–123,120	61–77,66
p_2	444–501,462	463–539,485	236–284,253	132–161,142	95–103,102	61–66,64	52–57,55
p_3	449–548,488	558–662,595	312–383,344	180–217,195	132–165,150	71–80,77	52–61,58
	LR	BV	SV	BR			
p_1	0.69–0.73,0.71	2.08–2.29,2.16	2.59–2.70,2.65	2.8–3.1,3.0 (5)			
p_2	0.50–0.53,0.52	3.16–3.44,3.29	3.65–3.92,3.73	4.0–5.8,4.6			
p_3	0.56–0.59,0.58	2.94–3.04,2.98	3.04–3.33,3.17	4.7–6.9,6.3			

Hypopygium (Fig. 16C). Anal point 19–38, 29 μm long, with 6–8, 7 setae; laterosternite IX with 3–4, 4 setae. Phallapodeme 56–68, 63 μm long; transverse sternapodeme 68–79, 72 μm long. Gonocoxite 169–188, 174 μm long; with large, bluntly right-angled superior volsella and simple inferior volsella. Gonostylus 68–75, 71 μm long; crista dorsalis conspicuous when in correct position, half as long as gonostylus, rounded; megaseta 8–13, 10 μm long. HR 2.43–2.56, 2.50; HV 3.34–3.49, 3.42.

Remarks

R. amplicristatus is quite similar to *R. fuscipes*, which also has a relatively prominent, elongate, but low crista dorsalis, although this is not illustrated by LEHMANN (1969 fig. 4). It differs in having a more tapering gonostylus, costa usually not extended, apparently fewer acrostichals, and sensilla chaetica on hind leg and not on middle leg.

Rheocricotopus (Rheocricotopus) eminellobus Saeth.

(Fig. 17)

Rheocricotopus eminellobus Saether, 1969: 85; 1971 figs. 6A, 8F; 1977 figs. 43A–C

The species was described from Alberta, but has since been reported from North and South Carolina (WEBB & BRIGHAM 1982: 11.53, 11.65). Eight specimens confirm the presence in southeastern U.S.A. and extend the distribution to Tennessee: 1 male, spring, 12 miles southeast of Gatlinburg on Rt. 441, Sevier Co., Tennessee, 4/5/78, P. L. Hudson; 1 pupal exuvia, West Prong, Pigeon River, Gatlinburg, Sevier Co., Tennessee, 3/5/79, P. L. Hudson; 1 male, Jocassee Reservoir, Oconee Co., Salem, South Carolina, 18/10/75, P. L. Hudson; 2 males reared from larvae, 2 females reared from larvae, 1 female reared from pupa, 1 larva, spring B, Issaqueena Forest, Clemson Univ., Pickens Co., South Carolina, 16/4/82, P. L. Hudson; 1 male, seep-small stream, Issaqueena Forest, Clemson Univ., Pickens Co., South Carolina, 26/4/81, P. L. Hudson (BAC, BMNH, USNM, ZMBN).

These males have an AR of 0.76–0.96, 0.86 (5); 6–11, 9 setae on the anal point (SAETHER, 1969 fig. 43); 3 sensilla clavata at apex of third palpal segment, and 0–1 sensillum chaeticum at 0.32 of ta_1 of middle leg and none on hind leg.

Four females including two female paratypes have 2–5 sensilla chaetica at 0.10–0.21 to 0.33–0.46 of ta_1 of middle leg, and 2–3 sensilla chaetica at 0.22–0.26 to 0.33–0.55 of ta_1 of hind leg.

The pupae conform to the description given by SAETHER (1969: 87) except that the shagreen is less extensive although some spinules still are distinct medially on tergites VII and VIII, the caudal spines on tergite VII are well developed and the caudal spines indicated by spinules on tergite VIII also as in *R. (R.) pauciseta*.

Five pupae from Issaqueena Forest have a total length of 2.50–2.79, 2.63 mm. The distance between anterior dorsocentral (Dc_1) and second dorsocentral (Dc_2) is 60–101, 80 μm ; between Dc_2 and Dc_3 41–64, 53 μm ; between Dc_3 and Dc_4 2–26, 17 μm . Number of spines in spine patches on T IV–VI are as: 22–30, 26; 33–50, 42; 39–66, 48. The spines are 11–15, 13 μm long on T IV; 15–23, 17 μm long on T V and VI.

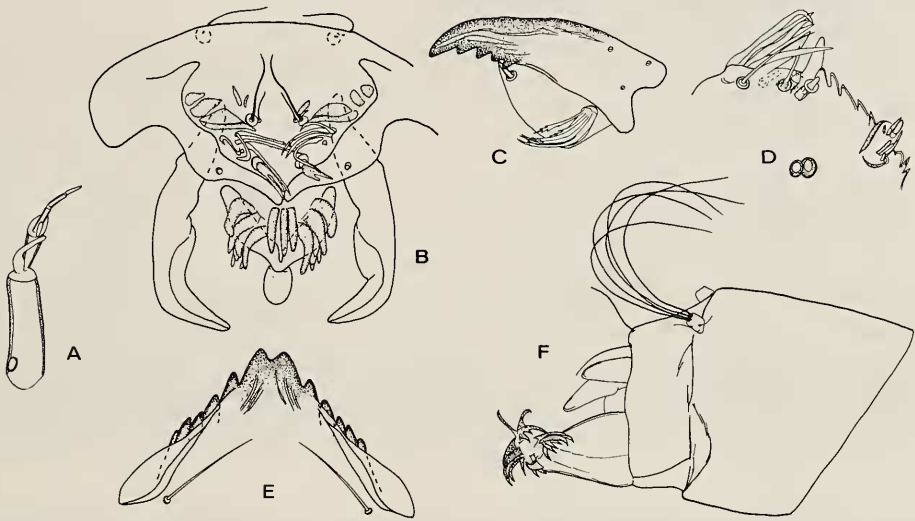


Fig. 17. *Rheocricotopus (Rheocricotopus) eminellobus* Saeth., larva: A. Antenna; B. Labrum and epipharyngeal area; C. Mandible; D. Maxilla; E. Mentum; F. Posterior end of abdomen.

Larva (n = 6, except when otherwise stated)

Total length approximately 3.2–4.0 mm (3). Head capsule length 359–421, 394 μm .

Head. Antenna as in Fig. 17A. Lengths of antennal segments (micrometers): 57–62, 60; 17–19, 19; 12–14, 13; 8–9, 9; 9. AR 1.16–1.24, 1.19. Basal antennal segment 15–19, 17 μm wide; distance from base to ring organ 2–9, 6 μm ; to basal mark of seta 12–17, 16 μm ; to second mark 26–40 μm (2); blade 26–38 μm (2) long. Lauterborn organs 9–11, 10 μm long. Labrum and epipharyngeal area as in Fig. 17B. Premandible 60–66, 63 μm long. Mandible (Fig. 17C) 113–129, 122 μm long. Maxilla as in Fig. 17D. Mentum (Fig. 17E) with combined width of median teeth 38–45, 41 μm wide; median teeth without accessory teeth; ventromental plates 15–26, 19 μm wide; with 12–13, 12 setae underneath.

Abdomen (Fig. 17F). Procercus 26–30, 28 μm high; 17–21, 19 μm wide; with longest anal seta 338–413, 391 μm long. Supraanal seta 71–75 μm (2) long. Anal tubules 68–75 μm (2) long, 26 μm (2) wide at base. Posterior parapods 131 μm (1) long.

Remarks

The specimens from South Carolina in many respects obscure the difference between *R. (R.) eminellobus* and *R. (R.) pauciseta*. The male gonostylus may approach that of *R. (R.) pauciseta* when seen in a different aspect and the inferior volsella shows tendencies to division. However, the superior volsellae easily separate the two species. The pupae are very similar and the differences in shagreen may not hold up on a larger material. The larvae also are similar, but *R. (R.) pauciseta* has an accessory lateral tooth on each median tooth.

effusus group

Superior volsella with triangular to tooth-like caudomesal projection. Humeral pit often large and ellipsoid, occasionally small.

Rheocricotopus (Rheocricotopus) pauciseta Saeth.

Rheocricotopus pauciseta Saether, 1969: 89; 1971 figs. 6C, 8D

The male imago has 2 sensilla chaetica at 0.13–0.28 of ta_1 of middle leg, none on hind leg. Otherwise see descriptions by SAETHER (loc. cit.)

Rheocricotopus (Rheocricotopus) effusoides spec. nov.

(Figs. 18–21)

Rheocricotopus effusus Saether, 1973: 58; 1977: 97, nec Walker 1856

Rheocricotopus spec. near *effusus* (Walker); CRANSTON, OLIVER & SAETHER 1983 fig. 9.66 A–D, F–G

Type locality: U.S.A., South Dakota, Yankton, Gavin's Point National Fish Hatchery, Eds Creek.

Type material: Holotype, male, with pupal and larval exuvia, Ed's Creek, Gavin's Point National Fish Hatchery, Yankton, South Dakota, U.S.A., 11/10/71, P. L. Hudson, (as *R. effusus* in SAETHER 1973: 58), in coll. Mus. Zool. Univ. of Bergen (ZMBN) No. 98. Paratypes: Male with pupal exuvia, mature female pupa, 2 males, 2 females, as holotype; 2 females with pupal and larval exuvia, Marne Creek, Yankton, South Dakota, U.S.A., 12/3/72, P. L. Hudson (CNC, ZMBN).

Diagnostic characters: See key on p. 69.

Etymology: From Latin, *effusus*, pour out, spread out, shed, and the epithet of the most closely related species, and New Latin – *oides*, denoting likeness of form.

Description

Male imago (n = 4)

Total length 2.83–3.12, 3.21 mm. Wing length 1.58–1.80, 1.71 mm. Total length/wing length 1.66–1.79, 1.73. Wing length/length of profemur 2.56–2.58, 2.57. Coloration yellowish brown with blackish brown confluent vittae and thoracic markings, scutellum brown.

Head. AR 1.39–1.61, 1.53. Ultimate flagellomere 473–548, 513 μ m long. Temporal setae 2–4, 3; 0–1, 0 inner verticals; 2–4, 3 outer verticals. Clypeus with 9–10, 9 setae. Cibarial pump, tentorium and stipes as in Fig. 18A. Tentorium 150–169, 159 μ m long, 36–38, 27 μ m wide. Stipes 146–158, 151 μ m long; 45–51, 48 μ m wide. Palp segments length (micrometers): 34–41, 39; 56–71, 63; 94–113, 102; 94–116, 104; 139–173, 157. Third palpal segment with 1 lanceolate sensillum clavatum.

Thorax (Fig. 18B). Anteprenotum with 4–8, 5 lateral setae. Humeral pit very large, ellipsoid usually with smaller, separate ellipsoid pit below. Dorsocentrals 12–16, 14; acrostichals 14–21, 18; prealars 3–6, 4. Scutellum with 8 setae.

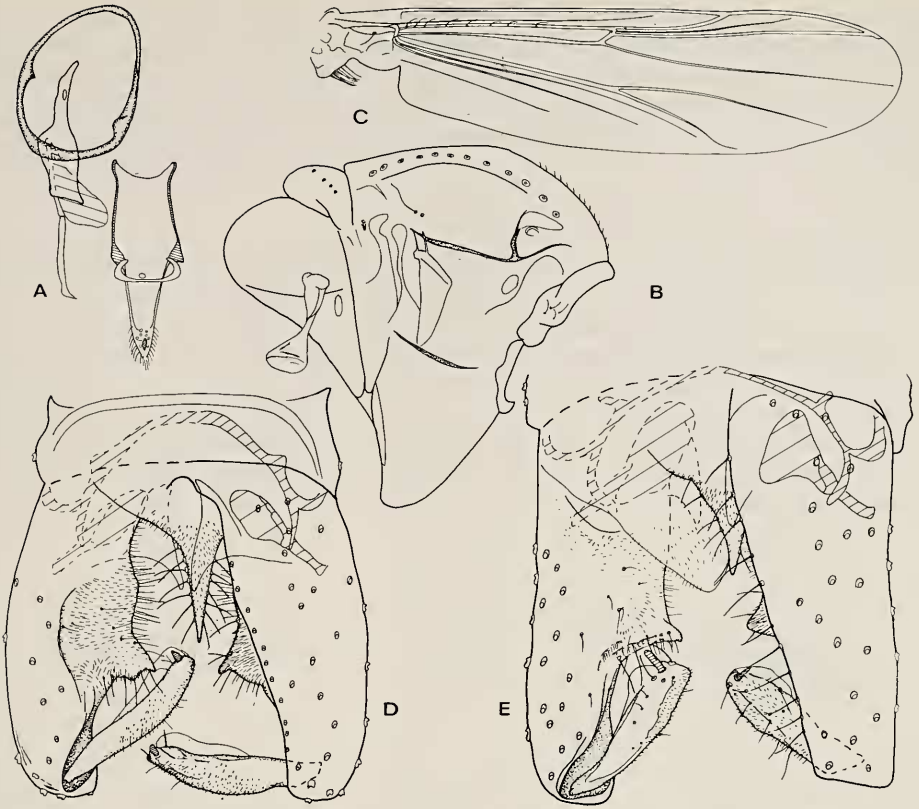


Fig. 18. *Rheocricotopus (Rheocricotopus)* spp., male imago: A-D. *R. (R.) effusoides* spec. nov.; A. Cibarial pump, tentorium and stipes; B. Thorax; C. Wing; D. Hypopygium of male from South Dakota; E. Hypopygium of *R. (R.) effusus* (Walk.) (holotype of *R. (R.) striatus* [Mall.]).

Wing (Fig. 18C). VR 1.05–1.10, 1.07. Wing membrane with fine punctation of microtrichia visible at 150 \times . Anal lobe slightly protruding. C extension 23–41, 36 μ m long. R with 6–8, 7 setae. Squama with 10–13, 11 setae.

Legs. Spur of front tibia 45–53, 49 μ m long; spurs of middle tibia 19–24, 23 μ m and 19–23, 21 μ m long; of hind tibia 45–53, 49 μ m and 15–23, 20 μ m long. Width at apex of front tibia 41–45, 43 μ m; of middle tibia 41–45, 43 μ m; of hind tibia 45–49, 48 μ m. Sensilla chaetica 2 (2) at 0.21–0.22 (2) to 0.32–0.43 (2) of ta_1 of middle leg; 0–2 (2) at 0.18–0.43 (1) of hind leg. Lengths (micrometers) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	614–699,664	690–841,761	444–558,499	255–312,285	161–217,193	123–142,130	71–80,75
p ₂	643–718	614–718	293–331	161–189	104–113	76	61–71,66
p ₃	652–718	728–898	369–463	208–246	142–198	99–104	76–80,77
	LR	BV	SV	BR			
p ₁	0.64–0.67,0.65	2.67–2.91,2.82	2.76–2.98,2.85	2.0–2.3,2.2			
p ₂	0.46–0.49,0.47	3.68–3.91,3.81	4.14–4.29,4.21	2.1–2.6,2.5			
p ₃	0.51–0.55,0.53	3.07–3.33,3.25	3.36–3.74,3.50	2.9–3.6,3.2			

Hypopygium (Fig. 18D). Anal point 75–98, 86 μm long; with 15–20, 17 setae; laterosternite IX with 5–8, 6 setae. Phallapodeme 75–98, 86 μm long, transverse sternapodeme 83–109, 100 μm long. Gonocoxite 191–221, 263 μm long; with well developed tooth-like caudomesal projection on superior volsella; inferior volsella simple, with a slightly hooked apex. Gonostylus 99–107, 103 μm long; crista dorsalis low but relatively well developed, megaseta 8–13, 10 μm long. HR 1.92–2.07, 1.97; HV 2.80–2.97, 2.88.

Female imago (n=5, except when otherwise stated)

Total length 2.84–3.40, 3.09 mm. Wing length 1.74–2.16, 2.00 mm (4). Total length/wing length 1.49–1.63, 1.56 (4). Wing length/length of profemur 2.83–2.92, 2.86 (4). Coloration pale yellow with brown separate vittae and thoracic markings, scutellum brownish yellow in central area.

Head. Flagellomere lengths (micrometers): 83–116, 99; 49–68, 61; 45–71, 62; 46–68, 61; 83–137, 108. AR 0.33–0.45, 0.39. Temporals 3–8, 5; all outer verticals. Clypeus with 10–16, 14 setae. Cibarial pump, tentorium and stipes as in Fig. 19A. Tentorium 150–188, 173 μm long; 23–41, 29 μm wide. Stipes 124–161, 148 μm long; 44–56, 50 μm wide. Apparent ocelli observed in 2 specimens, 23–32 μm apart. Palp segments length (micrometers): 41–51, 44; 49–71, 64; 68–109, 93; 86–124, 109; 131–184, 164. Third palpal segment with 5–7 (3) sensilla clavata at apex. Coronal suture complete or nearly complete.

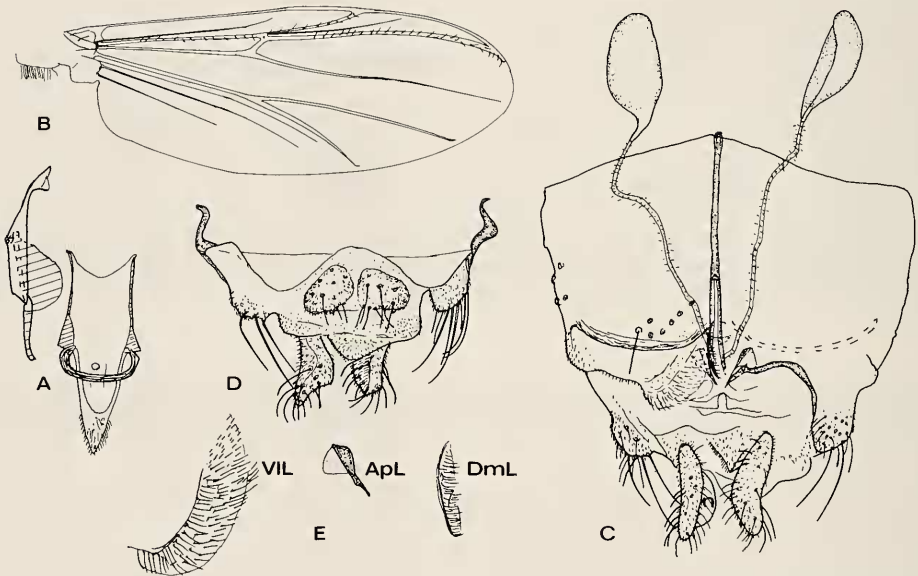


Fig. 19. *Rbeocricotopus (Rbeocricotopus) effusoides* spec. nov., female imago: A. Cibarial pump, tentorium and stipes; B. Wing; C-E. Genitalia, dorsal (C) and ventral (D) aspect and lobes of gonapophysis VIII (E) (DmL, dorsomesal lobe; VIL, ventrolateral lobe; ApL, apodeme lobe).

Thorax. Antepronotum with 5–8, 7 lateral setae. Humeral pit as in male. Dorsocentrals 12–17, 15; acrostichals 21–22, 21; prealars 4–5, 4. Scutellum with 12–18, 14(4) setae.

Wing (Fig. 19B). VR 1.04–1.13, 1.08(4). C extension 75–99 μm (3) long. Brachiolum with 1 seta; R with 12–20, 17(4) setae; R₁ with 4–9, 7(4); R₄₊₅ with 15–27, 21(4); extended part of costa with 2–5, 3(4) non-marginal setae. Squama with 14–22, 16 setae.

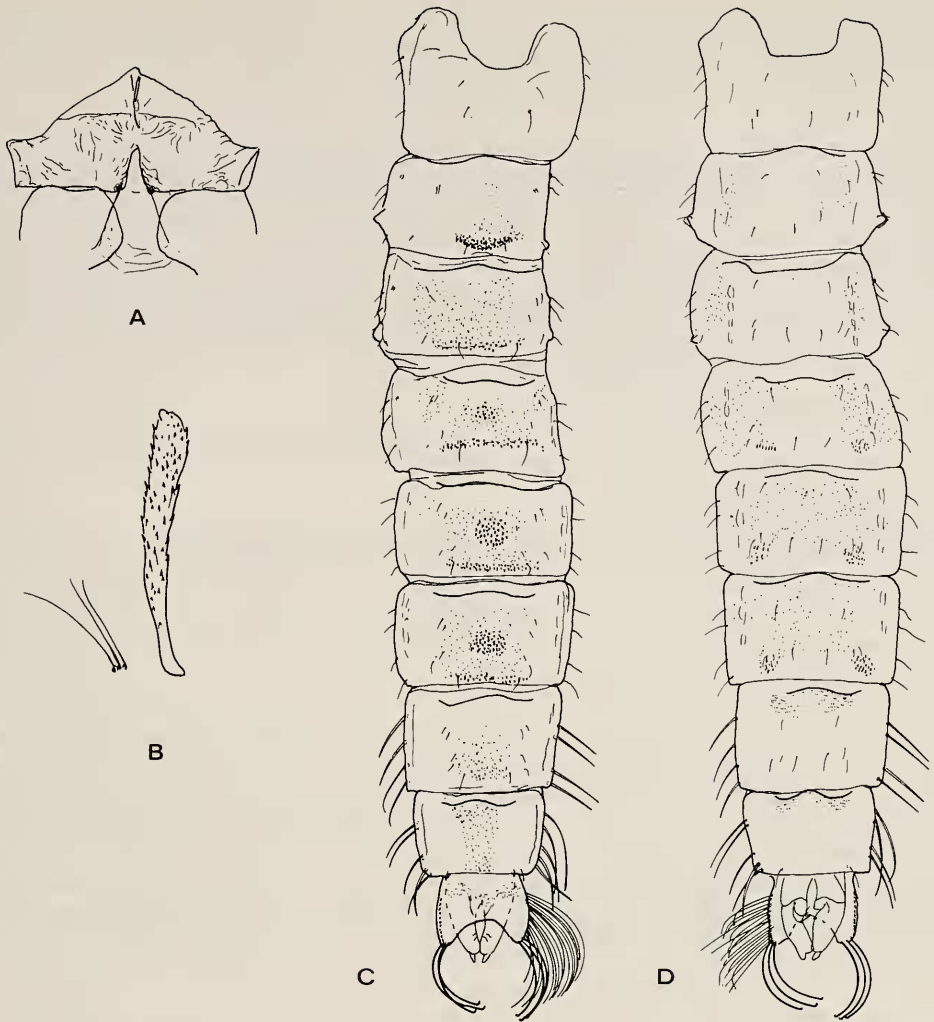


Fig. 20. *Rheocricotopus (Rheocricotopus) effusoides* spec. nov., pupa: A. Frontal apotome; B. Thoracic horn; C. Tergites; D. Sternites.

Legs ($n=4$). Spur of front tibia 34–53, 42 μm long; spurs of middle tibia 23–26, 24 μm and 19–23, 22 μm long; of hind tibia 38–60, 52 μm and 19–23, 22 μm long. Width at apex of front tibia 45–56, 51 μm , of middle tibia 47–58, 52 μm ; of hind tibia 58–68, 63 μm . Comb of 13–14, 14 setae; shortest seta 23–30, 27 μm long; longest seta 45–53, 49 μm long. Sensilla chaetica 5–8 at 0.15–0.28, 0.22 to 0.62–0.81, 0.73 on ta_1 of middle leg; 6 at 0.17–0.23, 0.20 to 0.64–0.85, 0.72 on ta_1 of hind leg. Lengths (micrometers) and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p_1	614–737,692	737– 874,817	454–529,495	246–302,277	170–198,183	109–123,119	76–80,78
p_2	671–784,732	709– 836,784	302–350,329	161–198,183	132–151,142	80– 95,86	66–76,71
p_3	690–794,749	813–1016,925	416–520,473	227–279,254	180–236,206	95–113,103	76–90,82

	LR	BV	SV	BR
p ₁	0.60-0.62,0.61	3.01-3.14,3.06	2.98-3.11,3.04	1.5-1.9,1.7
p ₂	0.41-0.43,0.42	3.78-3.94,3.38	4.56-4.70,4.60	1.4-1.8,1.6
p ₃	0.50-0.52,0.51	3.24-3.43,3.32	3.48-3.61,3.55	1.8-2.7,2.2

Abdomen. Number of setae on tergites I-VIII as: 20-39, 29(4); 30-54, 40; 23-44, 32; 20-43, 31; 23-48, 32; 28-44, 32; 17-30, 24; 21-43, 34. Number of setae on sternites I-VIII as: 0; 0-4, 2; 4-8, 5; 4-14, 8; 9-20, 14; 11-26, 16; 12-20, 17; 12-29, 20. No median setae on sternites I-IV or (in one specimen) on I-III.

Genitalia (Fig. 19C-E; SAETHER 1977 fig. 43A-C). Gonocoxite with 20-30, 24 setae; including 12-18, 14 strong and 8-15, 10 weak setae. Tergite IX strongly divided, with 17-32, 26 setae. Cercus 94-126, 109 μ m long. Seminal capsule 108-131, 117 μ m long including 19-26, 21 μ m long neck; 60-83, 71 μ m wide. Notum 128-154, 140 μ m long.

Pupa (n = 5, except when otherwise stated)

Total length 3.78-4.54, 4.10 mm. Length of thoracic horn/length of anal macrosetae 0.83-1.31, 1.07. Exuvia pale yellowish brown.

Cephalothorax. Frontal seta 56-101, 88 μ m (4) long; on frontal apotome (Fig. 20A). Vertical 49 μ m (1) long; postorbitals 49-56 μ m (2) and 30 μ m (1) long. Median anteprenotals 101-131, 119 μ m and 124-165 μ m (3) long; lateral anteprenotal 56-60, 56 μ m (4) long. Thoracic horn (Fig. 20B) 300-424, 348 μ m long; 49-86, 64 μ m wide. Anterior precorneal seta 146-169, 156 μ m long; median seta 94-150, 124 μ m long; posterior seta 71-98, 86 μ m long. Anterior dorsocentral (Dc₁) 56-98, 71 μ m long; Dc₂ 53-71, 60 μ m long; D₃ 38-86, 59 μ m long; Dc₄ 56-94, 78 μ m long. Distance between Dc₁ and Dc₂ 90-120, 101 μ m, between Dc₂ and Dc₃ 17-26, 22 μ m; between Dc₃ and Dc₄ 17-36, 23 μ m.

Abdomen (Fig. 20C, D). Shagreen absent on tergite I (T_I), weak median on T_{II}, stronger and covering most of segment on T_{III}, relatively strong and medially on T_{IV}-V_{III}, anterior on T_{IX}. Sternites I (S_I) and IX bare; shagreen on S_{II}-S_{III} anteriomedian and laterally; on S_{IV}-S_{VI} relatively strong except medioposteriorly; on S_{VII} and S_{VIII} anterior group shagreen. Pedes spurii A present on S_{IV}-S_{VI}. Pedes spurii B well developed on segment II and present also on segment III. About 120-200, 167 caudal hooklets on T_{II}. Conjunctions III/IV and IV/V with anteriorly directed spinules. Number of spinules in median patches on T_{IV}-T_{VI} as: 6-43, 29; 36-79, 56; 35-74, 58. Maximal lengths (micrometers) of spines as: 8-11, 10; 11-19, 15; 13-19, 16. L setae on segments I-V_{III} as: 3, 3, 3, 3, 4, 4, 4, 5;

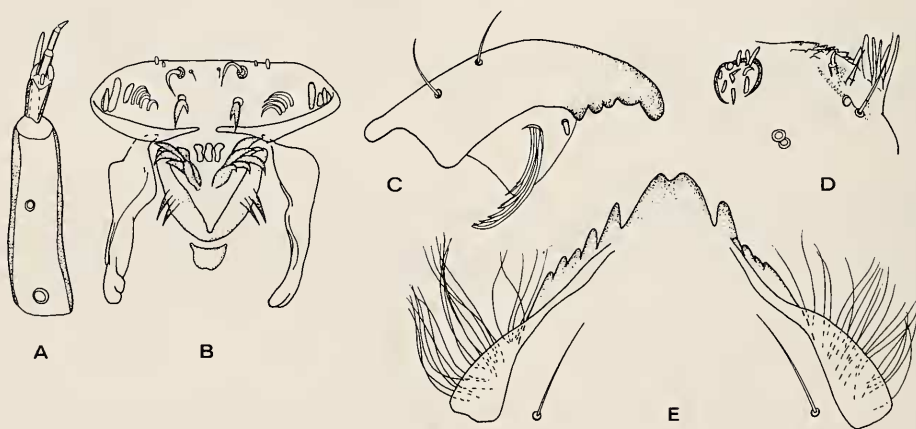


Fig. 21. *Rheocricotopus (Rheocricotopus) effusoides* spec. nov., larva: A. Antenna; B. Labrum and epipharyngeal area; C. Mandible; D. Maxilla; E. Mentum.

all lamelliform on segments VII and VIII. Anal lobe with 18–27, 22 setae in fringe; anal macrosetae 293–338, 319 μm long. Genital sac of male overreaching anal lobe by 56 μm (1), with a 26 μm (2) long apical tubercle; of female ending 105–131 μm (2) short of apex of anal lobe.

Larva ($n = 3$, except when otherwise stated)

Total length approximately 5.2 mm (2). Head capsule length 424–514 μm .

Head. Antenna as in Fig. 21A. Lengths of antennal segments (micrometers): 72–85, 17–19, 9–12, 7–8, 6–7. AR 1.79–2.06. Basal antennal segment 19–21 μm wide; distance from base to ring organ 12–15 μm , to basal mark of seta 12–15 μm , to second mark 43–55 μm ; blade 28–30 μm (2) long. Lauterborn organs 8–9 μm long; apical style of second segment 5–8 μm long. Labrum and epipharyngeal area as in Fig. 21B. Premandible 83–90 μm long. Mandible (Fig. 21C) 145 μm (1) long. Maxilla as in Fig. 21D. Mentum (Fig. 21E) with combined width of median teeth 28–37 μm ; ventromental plates 19–26 μm wide, with 32–33 setae underneath. Postmentum 233–259 μm long.

Abdomen. Procercus 41–45 μm (2) high, 36–38 μm (2) wide, with longest anal seta 549–567 μm (2) long. Longest body setae about 75 μm (1) long.

Remarks

R. effusoides, although very similar to *R. effusus*, differs in most measurements of all stages from that species although the differences are not strong.

Rheocricotopus (Rheocricotopus) effusus (Walk.)

(Figs. 18, 22)

Chironomus effusus Walker, 1856: 180

Orthocladius (Trichocladius) striatus Malloch, 1915: 517, syn. nov.

Cricotopus rivicola Kieffer, 1921: 804

Orthocladius (Dactylocladius) dorieri Goetghebuer, in GOETGHEBUER & DORIER 1931: 65

Trichocladius holosericeus Goetghebuer, in GOUIN 1936: 167

Trichocladius brunensis Goetghebuer, 1937: 275

Material examined: Holotype male, marked co-type, no further data, F. Walker (BMNH). *R. striatus* (Malloch), male, 2 slides nos. 3061, Creek Valley, Dubois, Illinois, U.S.A., 24/4/14, J. R. Malloch (NHSC); 5 males reared from larvae, 2 females reared from larvae, unnamed tributary of W. Fork of Rocky River, Iredell Co., North Carolina, U.S.A., 14/4/79, T. J. Wilda; 2 males reared from larvae, Spring B, Issaqueena Forest, Clemson Univ., Pickens Co., South Carolina, U.S.A., 16/4/82, P. L. Hudson; 1 male, paralectotype (misidentified) of *Chironomus glabricollis* Meigen (see p. 86); 1 male, River Fulda, Hessen, West Germany, 29/4/67, J. Lehmann; 3 males, 8 females, Malaise trap, Blesbekken, 1350 m. a. s. l., Kongsvoll, Oppdal, Sor-Trondelag, Norway, 9–28/8/82, leg. J. O. Solem (ZMBN, MNHN, RNSSL).

Description

Male imago ($n = 10$, except when otherwise stated)

The redescriptions given by ALBU (1968: 462) and LEHMANN (1969: 356) can be supplemented in some details:

Wing length 1.25–2.17, 1.58 mm. Wing length/length of profemur 2.59–2.82, 2.67. Ultimate flagellomere 397–548, 464 μm long. AR 0.99–1.33, 1.20. Temporal setae 3–7, 4; including 1–3, 2 inner verticals and 1–4, 2 outer verticals. Tentorium 131–176, 155 μm long; 30–38, 32 μm wide. Stipes 120–173, 142 μm long; 30–53, 40 μm (9) wide. Palp segments length (micrometers): 34–41, 34; 56–75, 65; 86–139, 104; 94–137, 109; 139–231, 169. Anteprepronotum with 4–6, 5 lateral setae. Dorsocentrals 9–16, 13; prealars 2–5, 3. Scutellum with 7–12, 9 setae. VR 1.05–1.11, 1.09. Wing membrane with fine punctation of microtrichia visible at 125x. Costal extension 26–53, 35 μm long. R with 2–13, 6 setae. Squama with 4–11, 7 setae. LR₁ 0.70–0.74, 0.72; LR₂ 0.51–0.55, 0.53; LR₃ 0.57–0.61, 0.59. Sensilla chaetica not

observed. Hypopygium as in ALBU (1968 fig. 9), LEHMANN (1969 fig. 5), PINDER (1978 figs. 38E, 117C) and Fig. 18E. Anal point with 5–13, 8 setae.

Female imago (n = 10, except when otherwise stated)

Total length 2.15–2.68, 2.49 mm. Wing length 1.40–2.07, 1.83 mm. Total length/wing length 1.26–1.52, 1.37. Wing length/length of profemur 2.66–3.04, 2.91. Coloration pale yellowish brown with darker vittae and thoracic markings.

Head. Flagellomeres length (micrometers): 68–92, 85; 41–64, 56; 41–64, 55; 41–64, 55; 83–120, 106. AR 0.40–0.45, 0.43. Temporals 2–11, 5; including 0–3, 1 frontal seta; 0–2, 1 inner verticals; 1–3, 2 outer verticals; and 0–4, 1 postorbitals. Clypeus with 10–15, 12 setae. Cibarial pump, tentorium and stipes as in Fig. 22A. Tentorium 128–173, 147 μm long; 19–30, 22 μm wide. Stipes 128–150, 138 μm long; 34–60, 53 μm wide. Palp segments (micrometers): 34–45, 38; 53–71, 64; 75–124, 112; 83–128, 115; 105–236, 202. Sensilla clavata 2–3 at apex of third palpal segment, second segment with apicomedian sensillum campaniformium. Coronal suture complete or nearly complete.

Thorax. Anteprenotum with 4–6, 5 lateral setae. Dorsocentrals 10–16, 12; acrostichals 18–26, 20; prealars 3–5, 4. Scutellum with 10–11 setae. Humeral pit as in male (LEHMANN 1969 fig. 13a).

Wing (Fig. 22B). VR 1.04–1.15, 1.09. Wing membrane with punctation visible at 125 x. Costal extension 60–113, 88 μm long. Brachiolum with 1–2, 1 seta. R with 8–18, 13 setae; R_1 with 6–9, 8; R_{4+5} with 13–24, 18 and C extension with 3–10, 7 non-marginal setae. Squama with 7–9, 8 setae.

Legs. Spur of front tibia 26–34, 31 μm long; spurs of middle tibia 19–23, 22 μm (9) and 15–19, 18 μm (7) long; of hind tibia 45–60, 51 μm (9) and 15–26, 20 μm long. Width at apex of front tibia 36–43, 40 μm ; of middle tibia 39–45, 41 μm (9); of hind tibia 45–54, 50 μm . Comb of 11–14, 12 setae; shortest

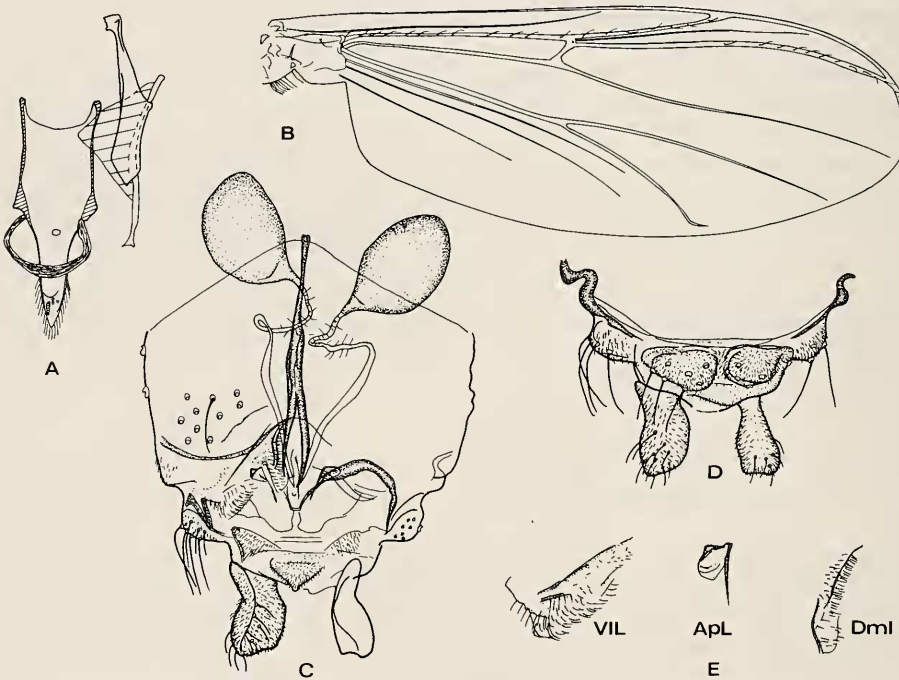


Fig. 22. *Rheocricotopus (Rheocricotopus) effusus* (Walk.), female imago: A. Cibarial pump, tentorium and stipes; B. Wing; C-E. Genitalia, dorsal (C) and ventral (D) aspect and lobes of gonapophysis VIII (E) (DmL, dorsomesal lobe; VIL, ventrolateral lobe; ApL, apodeme lobe).

seta 23–24, 27 μm long; longest seta 45–60, 52 μm long. Sensilla chaetica 0–4, 2 (9) at 0.18–0.49, 0.33 (7) to 0.53–0.75, 0.63 (6) of ta_1 of middle leg; 0–5, 2 (8) at 0.18–0.40, 0.32 (5) to 0.45–0.66, 0.60 (5) of ta_1 of hind leg. Lengths (micrometers) and proportions of legs ($n = 8\text{--}10$):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p_1	491–680,627	539–794,721	359–539,489	217–307,281	137–203,186	85–137,121	57–76,69
p_2	548–709,665	548–699,658	253–354,324	123–198,172	90–132,121	47– 76,64	47–61,57
p_3	501–695,638	624–841,778	331–477,435	165–246,217	132–198,176	57– 99,86	57–76,67
	LR	BV	SV	BR			
p_1	0.66–0.70,0.68	2.69–2.88,2.80	2.68–2.87,2.76	1.8–2.5,2.2			
p_2	0.46–0.51,0.49	3.75–4.40,3.99	3.91–4.34,4.08	1.7–2.5,2.2			
p_3	0.53–0.59,0.56	3.23–3.58,3.34	3.11–3.40,3.23	1.9–2.7,2.4			

Abdomen. Numer of setae on tergites I–VIII as: 20–31, 27 (9); 19–27, 22; 18–28, 22; 16–27, 22; 15–30, 22; 13–32, 21 (9); 11–26, 17 (9); 16–20, 18 (9). Number of setae on sternites I–VIII as: 0; 2; 2; 4–8, 6; 6–12, 10; 7–19, 12 (9); 13–22, 16 (9); 16–32, 24.

Genitalia (Fig. 22C–E). Gonocoxite with 9–14, 11 setae; including 5–6, 6 strong and 4–8, 5 weak setae. Tergite IX well divided; with 10–22, 15 setae including 8–13, 10 strong and 2–10, 5 weak setae. Cercus 60–109, 91 μm long. Seminal capsules 98–131, 116 μm long, 60–75, 66 μm wide, with 15–23, 18 μm well developed neck. Notum 98–131, 116 μm long.

Pupa ($n = 9$, except when otherwise stated)

Total length 2.79–3.17, 2.99 mm. Length of thoracic horn/length of anal macrosetae 0.89–1.06, 0.99. Exuvia pale greyish brown.

Cephalothorax. Frontal setae on frontal apotome, 38–64, 48 μm long. Median anteprenotals 131–188, 162 μm (8) and 94–169, 132 μm (7) long; lateral anteprenotal 56–113, 82 μm (8) long, second lateral anteprenotal present in 2 specimens, 56–82 μm long. Two postorbitals both 30–49, 42 μm (7) long. Thoracic horn (LANGTON 1984 fig. 31a) 227–289, 267 μm long; 34–53, 40 μm wide. Anterior pre-corneal seta 113–206, 163 μm long; median seta 114–169, 134 μm long; posterior seta 49–105, 75 μm long. Anterior dorsocentral (Dc_1) 53–83, 61 μm (8) long; Dc_2 49–86, 60 μm long; Dc_3 23–60, 38 μm long; Dc_4 38–60, 50 μm long. Distance between Dc_1 and Dc_2 94–128, 110 μm ; between Dc_2 and Dc_3 11–23, 18 μm ; between Dc_3 and Dc_4 8–21, 13 μm .

Abdomen (LEHMANN 1969 fig. 21b, LANGTON 1984 fig. 31a). Tergite I (T I) bare, T II with median shagreen, T III–VI with extensive shagreen, T VII–IX with median shagreen. Sternites I (S I) and IX bare, S II–VI with weak posterior and median shagreen, S VII–VIII with anterior group shagreen. Pedes spurii A present on S IV–VI. Pedes spurii B present on segments II and III. T II with about 90–140 caudal hooklets. Number of spines in spine patches of tergites IV–VI as: 22–46, 31; 28–47, 38; 26–55, 39. Maximal length (micrometers) of spines in patches of tergites IV–VI as: 11–17, 15; 13–21, 17; 15–23, 18. Conjunctives III/IV and IV/V each with 3–4 rows of anteriorly or posteriorly directed spinules; conjunctive V/VI with single, incomplete row. L setae of segments I–VIII as: 3; 3–4, 3; 3–4, 3; 3–4, 3; 3–4, 4; 4; 5; all lamelliform on VII and VIII. Anal lobe with 13–17, 15 (11–21 in LANGTON 1984: 98) lamelliform setae; anal macrosetae 255–293, 274 μm long. Genital sac of male apparently not reaching anal lobe, but folded in all measured specimens.

Larva ($n = 9$)

The larva is described by CRANSTON (1978: 303, 1982: 132). The larvae examined here have basal antennal segment 62–69, 66 μm long; second antennal segment 14–18, 17 μm (8) long; and AR 1.53–1.75, 1.62 (8). The cardinal beard consists of 25–31, 28 setae.

Remarks

R. (R.) effusus is quite similar to *R. (R.) effusoides* spec. nov. There are, however, several differences in all stages. Most suspicious are the differences found in the antennal and leg ratios and in the higher chaetotaxy of *R. (R.) effusoides* particularly of the male anal point and the female gonocoxite IX, tergite IX and remaining tergites. *R. (R.) effusus* apparently lacks sensilla chaetica in the male and sometimes also in the female, while *R. (R.) effusoides* of both sexes do have sensilla chaetica. *R. (R.) effusoides* also has several sensilla clavata on third palpal segment, while *R. (R.) effusus* only has 1–2.

The pupa of *R. (R.) effusus* has distinctly shorter frontal setae than *R. (R.) effusoides*. The differences in reduction of spine patch of tergite IV in relation to the patch on tergite V may not hold up. However, *R. (R.) effusus* has a few spinules in conjunctive V/VI not present in *R. (R.) effusoides*, generally fewer setae in fringe of anal lobe, and the genital sac apparently does not reach the apex of the anal lobe.

The European specimens examined are much larger than the Nearctic specimens. However, equally large variation is mentioned for instance for the pupae examined by LANGTON (1984: 98) who found a variation in total length of 2.2–4.4 mm. The Nearctic females, however, have a significantly higher number of temporal setae with both frontal setae and inner vertical setae sometimes present in the same specimen. The BV ratios, particularly on the mid leg, also are significantly higher and the dorsocentrals and acrostichals more numerous. The Nearctic females examined both apparently also lack sensilla chaetica on the tarsi, while the European females examined have sensilla chaetica both on mid and hind leg. It is not unlikely that the Nearctic population of *R. effusus* should be regarded as a separate subspecies. However, a larger material and a better knowledge of the geographical variation is needed for such a decision.

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